City of Memphis, Tennessee

Shelby County, Tennessee

Request for Proposal

for

800 MHz P25 Public Safety Radio Network

RFP #27927

June 8, 2016

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1. PROJECT OVERVIEW

1.1. INTRODUCTION

A. The two-way radio system currently used by the City of Memphis (Memphis) and Shelby County (County), Tennessee, to support public safety communications for Memphis, the County, and their partner agencies is reaching the end of its service life and is in need of replacement.

B. The purpose of this request for proposal (RFP) is to solicit proposals from qualified land mobile radio (LMR) system vendors, manufacturers, and/or system integrators to replace the LMR system, microwave system, and user mobile and portable radios, and provide needed tower upgrades, system installation and commissioning, and ongoing maintenance support for a state-of-the-art system.

C. Memphis, therefore, invites a proposal from qualified vendors for the provision of an 800 megahertz (MHz) Association of Public-Safety Communications Officials-International (APCO) Project 25 (P25) Phase 1 and Phase 2 dual-mode radio communications system to support mission critical communications within the county. The proposed communications system shall provide enhanced, two-way wireless communications capabilities to all users.

D. The proposed system will be jointly owned by the City of Memphis and Shelby County. The system procurement process is being administered by the City of Memphis. For brevity, the generic term “City” used throughout this RFP applies to both Memphis and Shelby County, unless otherwise specified.

E. Other agencies will be permitted to purchase equipment/services based on the results of this solicitation, unless prohibited under law.

1.2. BACKGROUND

A. The two-way radio system currently used by Memphis and Shelby County was installed in 2005 as an expanded system to serve Memphis and Shelby County with a common platform.

B. Motorola Solutions advised Memphis and Shelby County that the current SmartZone system is approaching the end of manufacturer-guaranteed parts, depot service, and technical support. End-of-support for major system components will begin in 2018.

C. The current system is a Motorola SmartZone, Release 4.1, trunked radio system that operates in the 800 MHz band. The system consists of three subsystems. Subsystem A consists of 22 channels and serves public safety users. Subsystem B consists of 14 channels and serves all non-public safety Memphis and County service department users. The third subsystem is a 5-channel IntelliRepeater site near Locke, Tennessee, which covers Meeman-Shelby Forest State

Park. The system as a whole utilizes ten tower sites located throughout Memphis and Shelby County.

D. Five communications centers, with a total of 44 radio console positions, utilize the current system: Memphis Police, Memphis Fire, Shelby County Sheriff's Office, Shelby County Fire Rescue, and Memphis Emergency Management. Dispatch consoles are Motorola Gold Elite computer-based workstations with Microsoft Windows XP operating systems. Microsoft terminated support for the XP operating system in April 2014. Motorola announced end of technical and guaranteed repair parts support for the Gold Elite console system in 2018.

E. The ten towers utilized by the system are interconnected by a Harris Constellation TDM microwave system, which provides intercommunications and system management between the repeater radios at the towers, the Motorola system master controller, and dispatch consoles.

    1. The replacement radio system will require a microwave system capable of transporting Internet Protocol (IP) packet traffic.

    2. Aviat Networks, the successor to Harris Microwave, has informed the City that the Constellation microwave system is not capable of transporting IP traffic, is nearing the end of manufacturer support, and should be scheduled for replacement.

F. Memphis and Shelby County currently utilize ten towers for the current SmartZone system. Six towers are owned and maintained by Memphis and four towers are owned and maintained by Shelby County. Memphis' six towers, built in 1994, are located at five fire stations and the Armour Center, and are co-located with Memphis radio maintenance and fire dispatch. Shelby County's four towers are located outside Memphis city limits near the towns of Locke, Fisherville, and Redwood, and at the Shelby Farms complex.

    1. Tower construction standards have undergone significant revisions since these sites were built. A tower engineering study revealed that the tower located at Fire Station 51 is at 130+ percent of capacity according to the current standard.

    2. All towers will require a structural analysis performed at the current standard and will need to be remediated to meet current standards using anticipated initial loading and allowing for a 25% margin to accommodate future tower loading needs.

G. The system currently supports approximately 13,000 subscriber mobile, portable, and control station radios. Memphis and Shelby County account for approximately 10,000 radios, and neighboring jurisdictions and users within the county account for approximately 3,000 radios.

1.3. DESIRED SYSTEMS AND SERVICES OVERVIEW

A. The goal of this project is to implement the recommendations identified in a recent MCP communications system assessment. A turnkey response, including all desired systems and services, from a single prime vendor, contractor, or integrator is desired.

B. It is understood that multiple vendors provide P25-capable mobile and portable radios. The City will accept, in addition to the turnkey proposals described above, separate proposals for mobile, portable, and control stations only.

C. It is understood that multiple vendors provide dispatch console systems which may be interfaced to the radio system via the Project 25 Console Subsystem Interface (CSSI). The City and County wish flexibility in purchasing dispatch console systems. The City will accept, in addition to the turnkey proposals described above, separate proposals for dispatch console systems.

1.3.1. *Systems*

A. The selected Respondent shall provide the following with current production state-of-the-art equipment:

1. P25 Phase 1/Phase 2 dual-mode LMR system, multiple simulcast zones and multicast site(s)

2. Dispatch console system for 50 plus positions

3. Logging recorders at dispatch centers

4. P25 Phase 1-/Phase 2-capable mobile, portable, and control station radios for all Memphis and County users

5. Six (6) gigahertz (GHz) Microwave system, IP- and time division multiplex (TDM)-capable

6. Radio and microwave system monitoring and management systems

1.3.2. *Services*

A. The selected Respondent shall provide the following services in concert with furnishing the above:

1. Design/engineer the P25 radio system to provide 95 percent coverage on street and in-building up to a 20 decibel (dB) attenuation building from a portable radio carried on the user's belt with a radio mounted antenna and a speaker/microphone.

2. Design/engineer a microwave system to interconnect the LMR sites and communications centers.

3. Conduct a structural analysis of all towers proposed for use in the system and mitigate any structural shortfalls to meet the current Telecommunications Industry Association (TIA) 222-G, *Structural Standard for Antenna Supporting Structures and Antennas*, Class III standard.

1.3.3. *P25 Standard Compliance*

A. The proposed trunked radio system shall comply with the latest applicable P25 suite of standards adopted as TIA and/or American National Standards Institute (ANSI) documents at the time of proposal submission.

B. The system shall be delivered in accordance with P25 Phase 1 and Phase 2 standards outlined in this RFP. If these standards change or are updated for final release, the selected Respondent shall implement the final standards at no additional charge to the City.

C. The system shall provide an Application Programming Interface (API) to allow Subscriber Units to be controlled by existing Computer Aided Dispatch (CAD). API shall allow control of standard P25 functions such as Dynamic Regrouping, Inhibit\UnInhibit, and Radio Check.

D. The proposed system shall not include proprietary features that prohibit or impede the use of P25-compliant subscriber equipment provided by any equipment vendor. Any proprietary features that would be optionally available should be clearly explained.

1.4. RFP OVERVIEW

A. This section provides a high-level overview of this RFP.

1. Section 1, Project Overview – This section provides background information and a general overview of the requirements contained in this RFP.

2. Section 2, Instructions to Respondents – This section provides instructions to Respondents, including, but not limited to: proposal due date, pre-proposal conference information, and evaluation criteria.

3. Section 3, Radio Communications System Requirements – This section provides requirements for the desired communications systems. The City requires procurement of

an 800 MHz P25 dynamic dual-mode trunked radio system. This section includes requirements for system configuration, site selection, radio frequency (RF) coverage, and site equipment. Subsections address the need for new radio dispatch consoles, network management system, and logging recorders.

4. Section 4, Backhaul Network – This section provides requirements for digital microwave backhaul equipment, network management, and engineering.

5. Section 5, Fleet Mapping – This section provides requirements for fleet mapping and template development.

6. Section 6, Site Development – If new or additional sites are necessary, this section provides requirements for site development work, including site compound preparation, site grounding, tower deployment, shelter deployment, and electrical and generator systems.

7. Section 7, Tower Analysis and Remediation – This section provides details for the existing towers to be analyzed under, and remediated to, current tower standards.

8. Section 8, Training – This section provides requirements for training programs to be developed by the selected Respondent.

9. Section 9, Warranty, Maintenance, and Support – This section provides requirements for the warranty, extended warranty, maintenance, and support of the proposed system and subsystems.

10. Section 10, System Implementation, Testing, and Acceptance – This section provides requirements for system cutover, staging, installation, fleet mapping, coverage testing, and final acceptance.

11. Section 11, Subscriber Equipment – This section provides requirements for subscriber equipment, including mobiles, portables, and control stations.

12. Glossary – A glossary is also provided.

B. Several appendices are also included with this RFP:

1. Appendix A: Proposal Form

2. Appendix B: Proposal Pricing Forms

3. Appendix C: Candidate Site List

4. Appendix D: Compliance Matrix

1.5. PROJECT SUMMARY

A. The selected Respondent shall provide the following project components:

1. Furnish and install system equipment and ancillary facilities
2. Engineering and system design
3. Project management
4. Software installation and programming
5. Training
6. Acceptance testing, including coverage testing
7. Cutover plan and execution
8. Warranty and maintenance

B. The selected Respondent shall furnish complete, highly redundant, and fully functional systems.

1. P25 LMR communications system, including the guarantee of system coverage and reliability
2. Point-to-point digital microwave backhaul network
3. Infrastructure facilities (e.g., towers, shelters, fencing)
4. Network management system (NMS)
5. Subscriber mobile and portable radio equipment

C. All equipment shall be provided in new condition and be covered by a full factory and/or manufacturer's warranty of not less than one year.

D. The City prefers that existing radio tower sites be utilized in the new system design, if possible. Respondents may utilize other towers, or propose green field construction of new towers, if it improves system coverage and helps realize the coverage goals.

E. Existing towers may require structural modifications to support the proposed new system and transitional loading. Respondents should account for the time required to remediate these towers, including time required for engineering, design, procurement, and implementation of any

required modifications.

F. In the event additional or alternate tower sites are proposed to meet a Respondent's coverage guarantee, the response must include letters of commitment from those site and tower owners indicating availability of tower space to accommodate the proposed facilities and antennas, and commitment to enter into negotiations with the City for tower space or construction on green field sites.

G. Work shall be planned, coordinated, and conducted with minimal interruption of service to existing critical systems.

1.6. PROPOSALS

A. Proposals shall completely describe the equipment and methods that will be used to implement the system. The intent of this document is to allow Respondents to propose the best equipment, technology, and methods available to provide state-of-the-art public safety communications systems of the highest quality and performance.

B. Proposals shall not be accepted that include systems or equipment within five years of the end of their respective life cycles at the time of system acceptance. Product lifecycle roadmaps must be provided.

C. Proposals shall not be accepted that include systems or equipment that will no longer be supported for software, spare parts, and repair by the Respondent or manufacturer within 20 years of system acceptance. Product roadmaps must be provided.

D. In the event that requirements are stated in more than one section and appear to conflict, the more stringent requirement shall apply.

E. Proposal Options:

1. Requirements described as an "option" or "optional" refer to features or equipment that may or may not be purchased by the City, or items whose quantities are not determined yet. It is not an option to respond to these requirements; therefore, Respondents are required to respond to all optional requirements to the greatest extent possible.

F. Alternate Proposals:

1. In the event a Respondent has a technological solution that does not meet the exact requirements in this RFP but will accomplish the desired results, a Respondent may offer more than one proposal as long as each proposal fully addresses the intent of the requirements set forth in this RFP.

2. Alternate proposals may be submitted under the same cover from the base proposal and be clearly marked “Alternative Proposal.” At a minimum, Respondents shall submit separate Proposal Pricing Forms, coverage maps, and system description for alternate options.

3. Respondents shall comply with the same submittal instructions in Section 2.3, Proposal Format, below.

G. Subscriber-only Proposals:

1. The City desires the option to separate the procurement of user radios from the balance of the system procurement. Respondents who desire to submit a proposal for the subscriber equipment only, as outlined in Section 11, may submit a proposal for user portable, mobile, and control station radio equipment only.

2. Respondents opting to submit subscriber-only proposals must familiarize themselves with the installation locations and requirements for control stations, mobile radios, and multi-unit charging systems.

1.7. INSURANCE REQUIREMENTS FOR COMMUNICATION EQUIPMENT

The Company shall not commence any work under this contract until it has obtained and caused its subcontractors to procure and keep in force all insurance required. The Company shall furnish the Risk Manager a Certificate of Insurance and/or policies attested by a duly authorized representative of the insurance carrier evidencing that the insurance required hereunder is in effect. All insurance companies must be acceptable to the City of Memphis and licensed in the state of Tennessee.

If any of the Insurance Requirements are non-renewed at the expiration dates, payment to the company may be withheld until those requirements have been met, or at the option of the City. The City may pay the renewal premiums and withhold such payments from any monies due the Company.

The Company shall indemnify, defend, save and hold harmless the City, its officers, employees, and agents, from and against any and all claims, demands, suits, actions, penalties, damages, settlements, costs, expenses, or other liabilities of any kind and character arising out of or in connection with the breach of this Agreement by Company, its employees, subcontractors, or agents, or any negligent act or omission of Company, its employees, subcontractors, or agents, which occurs pursuant to the performance of this Agreement, and this indemnification shall survive the expiration or earlier termination of this Agreement. The provisions of this paragraph shall not apply to any loss or damage caused solely by the acts, errors, or omissions of the City, its officers, employees and agents.

Each certificate or policy shall require and state in writing the following clauses:

Company shall provide notice to the City within three (3) business days following receipt of any notice of cancellation or material change in Company's insurance policy from Company's insurer. Such notice shall be provided to City by registered mail, to the following addresses:

City of Memphis
Attn: Risk Management
100 North Main Street, Suite 2028
Memphis, TN 38112

City of Memphis
Attn: Purchasing Department
125 North Main, Room 353
Memphis, TN 38103

The certificate of insurance shall state the following, "The City of Memphis, its officials, agents, employees and representatives shall be named as additional insured on all liability policies." The additional insured endorsements shall be attached to the Certificate of Insurance.

A. Workers Compensation:

The Company shall maintain in force Workers' Compensation coverage in accordance with the Statutory Requirements and Limits of the State of Tennessee and shall require all subcontractors to do likewise with Minimum LIMITS OF:

Employer's Liability	$100,000	Each Accident
	$500,000	Disease-Policy Limit
	$100,000	Disease-Each Employee

B. Automobile Liability:

Covering owned, non-owned, and hired vehicles with Minimum LIMITS OF:

$1,000,000 Each Occurrence – Combined Single Limits

C. Fidelity Bond / Employee Dishonesty:

For losses arising out of or in connection with computer fraud, fraudulent or dishonest acts committed by the employees of Company, acting alone or in collusion with others, including the property and funds of others in their care, custody or control with Minimum LIMITS OF:

$10,000,000 Each Occurrence/Aggregate

D. Commercial General Liability:

Comprehensive General Liability Insurance, including Premises and Operations, Contractual Liability, Independent Contractor's Liability, and Broad Form Property Damage Liability coverage with Minimum LIMITS OF:

$2,000,000	General Aggregate
$2,000,000	Products-Completed Operations
$2,000,000	Personal and Advertising Injury
$2,000,000	Each Occurrence (Bodily Injury & Property Damage)
$ 50,000	Fire Damage any One Fire
$ 5,000	Medical Expense any One Person

E. Errors And Omissions Liability:

The Company shall maintain such coverage for at least three (3) years from the termination or expiration of this agreement with Minimum LIMITS OF:

$10,000,000 Each Occurrence/Aggregate

F. Umbrella Liability:

$10,000,000 Each Occurrence Combined Single Limits with Minimum LIMITS OF

G. Property Insurance:

The Company shall be responsible for maintaining any and all property insurance on their own equipment and shall require all subcontractors to do likewise. The Company shall require all subcontractors to carry insurance as outlined above, in case they are not protected by the policies carried by the Company.

The Company is required to provide copies of the insurance policies upon request

1.8. FINANCIAL RESPONSIBILITY REQUIREMENTS

All submissions must include documentation of financial responsibility and stability.

For **publicly** held companies, documents must comply with following requirements:

1. The most recent independent audited financial statements for a fiscal year within the last 24 months. Note: Compiled or reviewed financial statements will not be accepted.
2. The audited financial statements must comply with the following requirements:

    a. Prepared with all monetary amounts in United States currency.
    b. Prepared under United States generally accepted accounting principles
    c. Audited under United States generally accepted auditing standards

3. The audited financial statements must include:

a. The auditor's opinion letter
b. Financial statements
c. Notes to the financial statements

For **privately** held companies, in lieu of audited financial statements, provide documentation clearly demonstrating financial stability of the company.

1.9. EQUAL BUSINESS OPPORTUNITY (EBO) PROGRAM

The City of Memphis has established the EBO Program to increase the participation of locally owned minority and women-owned business enterprises (MBE/WBE) in the city's purchasing activities.
It is the intent of the City to encourage M/WBE participation in this project. To further that participation, the City will advertise a separate procurement for non-technical services which are required in support of this project. These services will include;

- Lease of secure warehouse space for secure storage of the selected respondent's equipment and materials prior to installation on site.
- Provide inventory and equipment tracking and marking services prior to installation
- Provide equipment delivery services to the designated installation sites.
- Provide vehicles and drivers for coverage testing.
- Additional Project Management services for a designated liaison with the vendor for the City Of Memphis & Shelby County

Respondents should consider that these above services will be provided by the City and City contractors, and not include these costs in their proposal pricing. Selected vendors under this RFP will be required to coordinate with City of Memphis certified and registered M/WBE firms who may be selected to provide these services.

1.10. QUALITY ASSURANCE AND COORDINATION

1.10.1. *Standards and Guidelines*

A. The selected Respondent shall comply with the following standards, rules, regulations, and industry guidelines:

1. ANSI
2. National Electrical Manufacturer's Association (NEMA)
3. Electronic Industries Alliance (EIA)
4. TIA

5. Building Industry Consulting Service International (BISCI) *Telecommunications Distribution Methods Manual* (TDMM)

6. National Fire Protection Association (NFPA)

7. NFPA 70, *National Electrical Code*® (NEC®)

8. Institute of Electrical and Electronics Engineers (IEEE)

9. Federal Communications Commission (FCC)

10. Underwriters Laboratories, Inc. (UL)

11. American Society of Testing Materials (ASTM)

B. Respondents shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), as outlined in the following standards:

1. Motorola R56©, *Standards and Guidelines for Communication Sites* (latest revision)

2. Harris Site Grounding and Lightning Protection Guidelines (AE/LZT – 123 4618/1 – latest revision)

3. Other contractor/industry standards

a) Respondents shall provide information to the City for review and approval prior to contract award.

4. NEC®

5. Prevailing codes and ordinances applicable in Memphis and Shelby County, Tennessee

C. Governing codes and conflicts:

1. If the requirements of this RFP conflict with those of the governing codes and regulations, the more stringent of the two shall become applicable.

D. If a Respondent cannot meet any of the standards or guidelines listed above, the Respondent shall list any and all deviations for approval by the City in their proposal.

1.10.2. *Frequency Coordination and Licensing*

A. Memphis and Shelby County jointly hold LMR licenses for the current radio system under the following FCC call signs:

    1. WPAJ881

    2. WPLS340

    3. WQCZ418

    4. WQDB320

B. The City currently holds 6 GHz and 18 GHz licenses for the microwave system.

C. The selected Respondent shall ensure any changes from the currently licensed parameters listed comply with applicable frequency coordination criteria for exclusive use licenses as outlined in FCC rules Part 90.

D. The selected Respondent shall propose a licensable design per FCC rules. Any designs that do not satisfy licensing criteria for the frequencies identified above must be accompanied with licensing services to secure 700/800 MHz spectrum that will accommodate the design as proposed.

E. The selected Respondent shall be responsible for all microwave frequency research, prior coordination, and preparation of all associated FCC license applications and submittals on behalf of the City. The City shall be responsible for coordination fees and licensing fees, if any, and signatures, as applicable.

1.10.3. *Federal Aviation Administration (if applicable)*

A. The selected Respondent for site development shall complete Federal Aviation Administration (FAA) forms as necessary for determination of Hazard to Air Navigation to any impacted airport in Shelby County, including, but not limited to, the Memphis International Airport, DeWitt Spain Airport, Charles Baker Airport, Olive Branch Airport and Memphis Naval Support Activity, Millington, Tennessee.

1.10.4. *Project Management*

A. Respondents shall provide a project management plan that includes a detailed work breakdown structure (WBS), project scope, deliverables, schedule, quality assurance/quality control (QA/QC) processes, and risk management.

B. The plan shall describe how the Respondent intends to monitor and control the installation and deployment of the proposed system and mitigate risks in order to ensure that the system meets the design specifications and is delivered on time.

C. Regularly scheduled status meetings shall be established between the City project team and the selected Respondent. The selected Respondent shall provide a meeting schedule (minimum biweekly, i.e., every two weeks), subject to the approval of the City.

1.10.4.1. Scheduling

A. The selected Respondent shall develop and maintain a project schedule including tasks, milestones, start and end dates, task predecessors, and task owners based on an approved WBS.

B. The schedule shall represent tasks associated with completing work on all items identified in the WBS. The project schedule shall be updated with actual dates as tasks are completed.

C. The updated schedule shall be provided as an agenda item for all biweekly status meetings.

D. The schedule shall address the following, at a minimum, if applicable to the respective system component for which the Respondent is proposing:

1. Site surveys
2. Detailed design review
3. Site preparation
4. Equipment manufacturing
5. Factory acceptance testing
6. Equipment delivery
7. System installation
8. System configuration
9. System optimization
10. Acceptance testing
11. Coverage testing

12. User training

13. System cutover

14. CAD Interface (CADI) installation, testing and acceptance

15. System documentation development and delivery

16. System and equipment warranty

E. Respondents should use reasonable assumptions for identifying project dependencies that are not in their immediate control. Such assumptions include, but are not limited to:

    1. Radio system and microwave equipment cannot be installed until radio site tower modifications are complete. Respondents should use reasonable estimates for site work and development time within their respective project schedules.

F. The City will not be held responsible for delays in the schedule that are based on unreasonable assumptions from the Respondent.

G. The City will not be held responsible for costs associated with equipment storage for deliveries of equipment received in advance of scheduled installation dates.

1.10.4.2. Project Punch List and Issues Log

A. The selected Respondent shall establish and maintain a punch list and issues log, as mutually agreed to with the City, for site facilities, equipment, and acceptance tests.

B. The punch list/issues log shall be maintained in real-time and published weekly. The punch list shall include, at a minimum:

    1. Sequential list item number

    2. Date identified

    3. Item description

    4. Party responsible for resolution

    5. Expected resolution date

    6. Resolution date

7. Details about how each listed item was resolved and tested

8. Notes about the item

C. If responsibility for resolving an item is transferred to another person or group, a new entry shall be added to the punch list and the original entry shall be appropriately noted.

D. The selected Respondent shall be responsible for reviewing each punch list item and advising the City of any changes. The status of punch list items shall be updated during each biweekly status meeting.

1.10.4.3. Project Meetings

A. A project kickoff meeting shall be scheduled prior to the beginning of the project.

B. Biweekly project status meetings shall be scheduled following contract award and the initial kickoff meeting. Based upon project activity, these meetings may be scheduled to occur weekly as necessary.

C. The selected Respondent shall be responsible for scheduling the meetings as well as preparing meeting agendas and minutes. In addition to those identified in Section 1.7.4.1 above, meeting agenda items shall include, at a minimum:

1. Schedule review

2. Status of deliverables

3. Risk items

4. Changes

5. Plans for the next period

6. Action item assignments

7. Punch list/issue log review

1.10.4.4. Document Control and Management

A. The selected Respondent shall maintain a document repository on a file transfer protocol (FTP) site. All pertinent system design documents, agendas, minutes, and all other documents shall

be maintained on this site. All project teams and team members shall have access to this FTP site.

1.10.4.5. Project Staffing

A. Project staffing shall be managed by the selected Respondent based on workload and the level of effort throughout the implementation/installation process; however, the positions identified below shall be staffed throughout the duration of the project and shall not be changed without prior approval of the City.

B. Selected Respondent's Project Manager:

1. The selected Respondent's project manager shall be the primary point of contact between the City and the selected Respondent.

2. The selected Respondent's project manager shall bear full responsibility for supervising and coordinating the installation and deployment of the communications system; be responsible for development and acceptance of the project management plan; managing the execution of the project against the plan; and overseeing the day-to-day project activities, deliverables, and milestone completions.

3. The selected Respondent's project manager shall be responsible for coordination of the biweekly status meetings.

C. Selected Respondent's Project Engineer:

1. The selected Respondent's project engineer shall have primary responsibility for managing the system design and ensuring that the system is installed in accordance with the approved system design.

2. Any deviation from the system design shall be subject to project change control procedures and shall not be undertaken until approved by the City.

3. The selected Respondent's project engineer shall ensure the development of block diagrams, system level diagrams, and rack diagrams to assist the installation team in completing the system installation.

4. The selected Respondent's project engineer shall supervise the development and execution of the factory, system, and coverage acceptance test plans and guide the project team through the processes and procedures necessary to prove that the system performs as specified in the contract. No test plan shall be executed until approved by the City.

D. Subcontractors:

1. Subcontractors and subcontractor personnel, if any, shall be supervised and managed by the project manager.

2. Proposed subcontractors shall be identified in the Respondent's proposal. Personnel resumes, background information, experience, references, and qualifications shall be submitted with the same information as the Respondent. The City reserves the right to reject any proposed subcontractor.

1.10.5. *Quality Assurance/Quality Control Program*

A. Respondents shall include a preliminary quality assurance/quality control (QA/QC) plan with their response. The plan shall address all stages of the project, including, but not limited to:

1. Procurement

2. System design

3. Installation

4. Implementation

5. Testing

6. Cutover

B. The QA/QC plan shall specifically describe the plans and procedures that ensure the proposed system is designed in accordance with the standards and requirements described in this RFP.

C. The selected Respondent shall submit a final QA/QC plan for review during preliminary design.

D. The final QA/QC plan shall address the following project tasks:

1. Design analysis and verification

2. RF coverage analysis and verification

3. Design changes and document control

4. Material shipping, receiving, and storage

5. Site preparation (if required)

6. Field installation and inspection

7. Equipment inventory and tracking

8. System testing and validation

9. Software regression testing

10. Deficiency reporting and correction

11. Implementation and cutover

12. Training and certification

E. The final QA/QC plan shall be included as part of the project management plan developed by the project manager.

F. The final QA/QC plan shall be an integral part of the project and include City personnel as part of the review and approval process for all deliverables and submittals.

1.11. PROJECT SUBMITTALS

A. Key project deliverables and submittals are outlined below and are described in further detail throughout this RFP.

1. All project submittals shall be subject to review and approval by the City and its engineer/consultant.

2. All submittals shall be provided in hard copy, properly bound, and in electronic format on a universal serial bus (USB) flash drive. One original plus Twelve hard copies shall be required.

3. All submittals shall include a cover letter or letter of transmittal, signed, dated, and fully describing the contents of the submittal.

1.11.1. *Project Management Plan*

A. A complete project plan aligning with industry standards, such as the Project Management Institute's *A Guide to the Project Management Book of Knowledge* (PMBOK® Guide), shall be provided. The project plan shall describe execution, management, and control of the project.

B. The project plan shall cover and include the following main aspects:

1. Scope Management
2. Requirements Management
3. Schedule Management
4. Financial Management
5. Quality Management
6. Resource Management
7. Stakeholder Management
8. Communications Management
9. Project Change Management
10. Risk Management
11. Procurement Management

C. It is the intent of the City to have a formally agreed and version-controlled project management plan approved in the early stages of the project, and applied throughout.

1.11.2. *Preliminary Design*

A. The selected Respondent shall submit the preliminary design package within 45 days of contract award, which shall include:

1. P25 system design and required tower sites
2. Coverage maps based upon final system design
3. System migration/implementation plan
4. QA/QC plan
5. Detailed project schedule
6. System block diagrams

7. Radio and microwave channel plans
8. Microwave path engineering report(s)
9. Equipment room overview drawings
10. Equipment rack/cabinet elevation drawings
11. Tower profile drawings indicating antenna mounting locations
12. Detailed material lists for each site
13. 30-day Operational Test Plan
14. Coverage acceptance test plan (CATP)
15. CADI API documentation

1.11.3. *Final Design*

A. The selected Respondent shall submit the final design package within 90 days of contract award, which shall include:

1. Any updates to previously submitted design information
2. Cutover plan
3. Factory test data
4. Site installation drawings
5. Structural analyses and results

1.11.4. *System Staging, Delivery, and Installation*

A. System staging must be performed in the United States.

1. The selected Respondent shall submit a detailed factory acceptance test plan (FATP) outlining a comprehensive series of tests that will demonstrate proof of performance and readiness for shipment. The FATP shall be submitted no later than 30 business days before testing begins.

    a) The City will have 20 business days to approve the FATP.

B. The selected Respondent shall submit a Bill of Materials/packing list with two copies for each equipment shipment. The packing list shall include the following information, at a minimum, for each component included in the packaging:

    1. Manufacturer

    2. Model

    3. Serial number

    4. Unique identification of the package containing the item

C. All items shipped by the selected Respondent or their suppliers shall also include the above information in a barcode format.

D. All equipment shall be delivered to secure warehouse facilities in Shelby County that are contracted by the City of Memphis with a selected MBE/WBE enterprise through the City's EBO Program. Locations and addresses will be provided upon selection of an EBO contractor.

E. Title to all equipment shall pass to the City upon system acceptance.

1.11.5. *Final System Acceptance*

A. The selected Respondent shall submit a detailed final acceptance test plan (ATP) outlining a comprehensive series of tests that will demonstrate proof of performance and readiness for final acceptance by the City.

B. The ATP shall be submitted no later than 15 business days before testing begins.

    1. The City will have ten business days to approve the ATP.

1.11.6. *As-built Documentation*

A. The selected Respondent shall submit three (3) final and complete sets of as-built documentation, including:

    1. Documentation index

    2. Factory test data

    3. Field test reports

4. Coverage test reports
5. Warranty documentation
6. Detailed material lists for each site
7. As-built system block diagrams
8. As-built site drawings, including all cabling and terminations
9. Site layout drawings, as appropriate
10. Tower drawings showing any new installations
11. System operation and maintenance manuals
12. CADI API documentation

2. INSTRUCTIONS TO RESPONDENTS

2.1. OVERVIEW

A. Issuance of this RFP does not obligate the City to contract, in whole or in part, for services specified herein. The City reserves the right to cancel this solicitation, in whole or in part, or to reject, in whole or in part, any and all proposals. Cancellation of this RFP or any subsequent award will be posted on the City's website: www.memphistn.gov under the section titled "Government News."

B. Any firm receiving a mailed solicitation and not bidding will be electronically removed from the City's mailing list after 3 consecutive non-responses or no bids.

C. This solicitation shall be in accordance with the City's Purchasing Policies and Procedures, which may be amended from time to time.

D. Proposers must comply with all applicable licensing requirements. Pursuant to the City's Charter, Article 71, Section 777 et seq., it is unlawful to operate a business within the limits of the city of Memphis without possessing a Memphis and Shelby County business license, excepting non-profit organizations that qualify as tax exempt under Sec. 501(c)(3) of the Internal Revenue Code.

1. Upon award notification and prior to the City issuing a properly executed purchase order or entering into a contract with the vendor, the successful vendor, whose principle business address is located within the limits of the city of Memphis, will be required to submit, along with the required insurance and other required documentation, a copy of (1) the tax-exempt ruling or determination letter from the Internal Revenue Services; or (2) its current Memphis and Shelby County Business Tax Receipt/License.

2. This procurement may be subject to the requirements of Ordinance No. 5114 which establishes a local preference for local businesses located within the City. A copy of your current Memphis and Shelby County Tennessee Business Tax Receipt must accompany the proposal for consideration of this ordinance.

3. All material submitted pursuant to this RFP shall become property of the City.

4. To the extent permitted by law, all proposals submitted in response to this RFP shall be kept confidential until the proposals have been evaluated and the intent to award is announced.

    a) Until the intent to award is announced, no information regarding any proposal will be released to anyone, except members of the Evaluation Committee who are responsible for evaluating the proposals and other appropriate City staff.

    b) All information provided by the Vendor in response to this RFP will be considered by the Evaluation Committee in evaluating the proposal and making an award recommendation.

2.2. PROPOSAL SUBMISSION

A. Proposals must be received by September 9th, 2016, at 2:00 p.m. local time. Proposals received after this time will not be considered.

B. Respondents shall submit one (1) bound original and (12) bound copies of the proposal to the City. Each package shall also include a copy of the proposal in electronic format on USB flash drive. The Proposer shall submit their signed proposal in a sealed envelope/package indicating on the outside the company name and the request for proposal number. Proposals shall be addressed to:

Attention: Eric Mayse
City of Memphis
125 N Main St, Room 354
Memphis, TN 38103

C. All proposals must be signed by an authorized representative of your organization. Unsigned proposals will be considering non-conforming.

D. The proposal must set forth accurate and complete information as required by the RFP. Unclear, incomplete, and/or inaccurate documentation may not be considered for a contract award. Incomplete proposals will not be considered for selection if the omission(s) are determined, in the City's sole discretion, to be significant. Falsification of any information may result in disqualification.

2.3. MANDATORY PRE-BID CONFERENCE

A. A mandatory pre-bid conference will be held on June 28th, 2016 at 9:00 a.m. local time. The meeting will be held at 600 Jefferson Avenue Memphis, TN. Interested firms who plan to attend need to advise the city and provide an anticipated staff count no later than 5pm on Thursday June 16th. Please note that organized tours of the current radio sites and dispatch centers will be conducted on the afternoon of June 28th, June 29th and June 30th. This will be an opportunity for prospective vendors to gather site specific information for their use in proposal preparation. Firms may register for the pre-bid conference and site tours by emailing: Eric Mayse at eric.mayse@memphistn.gov

B. Respondents may submit questions in writing only, to the City in electronic format to Eric Mayse, eric.mayse@memphistn.gov. Initial questions must be received at least five days prior to the pre-bid conference in order for them to be addressed at the conference. During the conference, the City shall provide informal answers to any questions received and hold an open discussion regarding the project. Additional questions can be submitted in writing no later than July 8th. , 2016. Oral responses provided at the pre-bid conference shall not be binding on the City. The deadline for all questions is July 8th, 2016 at 5:00 p.m. local time.

C. Offerors shall not, under any circumstances, contact any other City official, employee or agent (including senior City management or City employees with whom Offeror has an existing business or personal relationship) to discuss this RFP. Utmost discretion is expected from Offerors and all RFP recipients. Any Offeror attempting to circumvent this process may be subject to elimination from further participation in the proposal process.

D. Following the conference, all attendees shall be provided with a copy of the sign-in sheet, questions, and formal written responses. Question responses will be available no later than two weeks following the question submission deadline.

E. Following the pre-bid conference, a familiarization tour of the ten tower sites and five communications centers will be conducted. It is anticipated the tours will require a minimum of two days to complete. It is highly recommended that all Respondents' and subcontractors'

sales, engineering, and site development personnel who may be involved with this project attend.

2.4. SCHEDULE OF EVENTS

A. While the City is not obligated to comply with the following timeline, it intends to comply with the following schedule, which may be changed in the City's sole discretion.

Table 1 – Schedule of Events

Event	Date
Solicitation Issued	June 7th, 2016
Pre-Bid Conference	June 28th, 2016 at 9 a.m.
Written Questions Due at City	July8th, 2016 at 5 p.m.
Response/Addendum Issued	July 22, 2016
Proposal Due	September 9th, 2016 at 2 p.m.
Evaluation of Proposals	Beginning September 12th, 2016
Notice of Intent to Award	TBD

2.5. PROPOSAL FORMAT

A. Respondents shall complete the compliance matrix provided in Appendix D. Failure to respond to any item on the compliance matrix may cause the proposal to be rejected.

B. Respondents shall adhere to the proposal format provided below, organized by section.

1. Section 1: Cover letter and non-collusion affidavit (Appendix E)

2. Section 2: Table of contents

3. Section 3: Executive summary

4. Section 4: Qualifications

   All Respondents shall provide information describing experience and qualifications with similar projects in their proposal, and upon request from the City, including, but not limited to:

   a) Descriptions of the Respondent's qualifications

   b) Resumes of key personnel and subcontractors

   c) Supplementary information

d) A list of five systems/solutions of similar size and complexity, successfully completed by the Respondent, including:

1) Name of the system/solution

2) Location

3) Contact person

4) Contact telephone number

Note: These references will be contacted. Failure of a reference to respond may count against a Respondent's final score. Respondents are urged to contact references and request their prompt response.

5. Section 5: Description of the system/solution, including equipment, software, design, and services to be provided

a) Radio communications system, including RF coverage predictions

b) Dispatch console and logging recorder systems at all locations

c) Tower remediation plan

d) Microwave backhaul connectivity

e) System management systems

f) System event monitoring systems

g) Additional subsystems (if applicable)

h) Detailed equipment specification sheets for all proposed equipment

i) System design information, including a complete detailed description, block diagrams, equipment layouts, and equipment lists necessary to provide a complete and comprehensive description

6. Section 6: Proposed scope of work and detailed responsibilities of the Respondent and City

7. Section 7: Preliminary project schedule with detailed Gantt chart

8. Section 8: Training programs and additional information not covered in other sections

9. Section 9: Point-by-point compliance matrix

   Respondents shall provide compliance statements in the spreadsheet found in Appendix D for each outline level of this RFP. Respondents shall provide a response to every section with which they do not comply. Compliance statements are limited to three choices:

   a) COMPLY – The proposal meets or exceeds the specified requirement. This does not require a response. By not responding, Respondents acknowledge that they are providing the equipment and/or service associated with that paragraph.

   b) COMPLY WITH CLARIFICATION – The proposal does not meet the exact stated requirement; however, meets a substantial portion of or meets the intent of the requirement. Respondents must provide a detailed explanation when using this statement.

   c) EXCEPTION – The proposal does not meet the specified requirements. Respondents must provide a detailed explanation when using this statement.

10. Section 10: System and subsystem warranty information to include; financial plan to reimburse City for warranty work, a list of maintenance plans and alternate tiers available, spare parts list and 15 year cost of ownership information,

11. Section 11: Total proposal cost and detailed pricing breakdown

    Respondents shall provide total proposal cost and itemized pricing using the pricing forms provided in Appendix B: Proposal Pricing Forms, to the greatest extent possible. Costs for optional items shall also be provided on the forms. Alternate proposals shall be provided a separate set of Proposal Pricing Forms.

12. Section 12: Documentation of Financial Responsibility and Stability

2.6. EVALUATION

A. The City shall evaluate proposals based on a number of criteria, including:

1. Technical response and cost – 50%
2. Expected life cycle of proposed solution – 10%
3. Warranty, maintenance, and support costs – 10%

4. Reuse of existing equipment and infrastructure – 5%
5. Demonstrated history of providing similar services to comparable entities – 10%
6. Perpetual licensing – 5%
7. Trade-in Allowance – 10%

B. Criteria for Technical Response and Cost will include, among other considerations inherent with the technical system and cost, creative solutions with regard to financing availability such as flexible payment terms and plans as well as incorporation of minority participation based on percentage of overall costs.

2.7. ADDENDA TO THE RFP

A. The City reserves the right to re-issue or change any portion of the RFP after the initial issue date, the City will make modifications by issuing a written amendment, which will be posted on the City's website (www.memphistn.gov).

B. No objections with regard to the application, meaning, or interpretation of the specifications will be considered after the opening of the subject proposals.

1. If there are questions or concerns regarding any plans, terms, specifications or other proposed documents, a written request for interpretation thereof may be submitted to the City Purchasing Agent prior to the deadline date. The organization submitting the request shall be responsible for the prompt delivery of the request.

2. Any interpretation in response to the written request will be made only by addendum duly issued, and a copy of such addendum will be mailed or delivered to each organization receiving a set of such documents and/or posted on the City's website. The City will not be responsible for any other explanation of interpretation of the proposed documents.

3. By submission of its proposal, a vendor shall be deemed to have understood fully the contents and meaning of the RFP.

2.8. AWARD OF CONTRACT

A. The City intends to award a contract for the total system package to one vendor. However, the City specifically reserves the rights below, consistent with procuring a system that best meets the needs of system users.

1. The City reserves the right to accept or reject any or all proposals, alternates, or any portion thereof.

2. The City reserves the right to accept all or part of any proposal depending solely upon the requirements and needs of the City.

3. The City reserves the right to seek clarifications of any proposal submitted or specific aspects of any proposal prior to award of the contract. After seeking such clarification, the City shall allow the Respondent an opportunity to provide the requested clarification.

4. The City reserves the right to adjust item quantities and/or reconfigure the communications system in the best interest of the City subsequent to award of the contract.

5. The City reserves the right to separate the purchase of user mobile and portable radios from system infrastructure in a separate procurement.

6. If multiple contracts are awarded, in lieu of a turnkey contract, the City may either:

    a) Negotiate additional scope with one or more of the selected Respondents to assume Prime Contractor status, or

    b) Contract with the selected Respondent to provide system integration or prime contractor services, provided the selected Respondent has submitted a proposal for those services.

B. The selected Respondent shall assume total responsibility for maintaining liability insurance covering the following items:

1. Project design

2. Implementation

3. Licenses

4. Shipping

5. Receiving

6. All site work required

7. Any items required for the selected Respondent or any required subcontractor(s).

C. Any protest of award must be filed in writing with the Purchasing Agent within five (5) calendar days of the intent to award announcement at the following address:

City of Memphis Purchasing Agent
125 N Main St, Room 354
Memphis, TN 38103

Notice will be emailed to all vendors that submitted a proposal in response to this RFP. The email will be sent to the contact email provided in the vendor proposal. The intent to award notification shall be deemed publicly announced on the date specified on the notice.

Any contract resulting from the proposals received in response to this solicitation shall be construed in accordance and governed by the laws of the State of Tennessee. All actions, whether sounding in contract or in tort, relating to the validity, construction, interpretation and enforcement of this Agreement shall be instituted and litigated in the courts of the State of Tennessee, located in Shelby County, Tennessee without regard to conflicts of laws principles.

D. The award of contract will be made on the basis of the best proposal, as determined by the City, which meets the requirements and criteria set forth in the solicitation. The City may fund all or any part of a proposal, and the City will only accept proposals for services requested. The proposal submitted in response to this solicitation is not a legally binding document; however, the contract, which will be based on information provided in the proposal, becomes legally binding once all parties have signed it.

    1. Any contract resulting from this RFP shall be subject to the City of Memphis General Terms and Conditions set forth in this solicitation. The successful contractor shall be required to execute the contract originated by the City of Memphis and satisfy all contract requirements as specified by the City. One or more contracts may be awarded under this RFP, and any contract awards and amounts are subject to the availability and appropriation of funds.

2.9. RFP TERMS AND CONDITIONS

A. The Offeror shall bear the total costs for any and all appearances and the costs associated with preparing the proposal or responding to the RFP. **The City shall not, in any event, be liable for any expenses incurred by Offerors during the proposal process, including the preparation and/or submission of the proposals. Proposals shall not include any such expenses as part of the proposed budget.**

B. The City reserves the right to extend the submission deadline, if such action is considered necessary by the City. In the event the deadline is extended, the Offerors will have the right to retrieve and revise their proposals.

C. The City reserves the right to withdraw this solicitation at any time prior to making an award based on this solicitation.

D. If an Offeror discovers any ambiguity, conflict, discrepancy, omission or other error in the RFP, it shall immediately notify, in writing via fax or e-mail, the City of such error request modification or clarification of the document. The Offeror shall include the RFP number, page number and the applicable paragraph title. The City will issue/post any revisions to the RFP on the City's website. The Offeror is responsible for clarifying any ambiguity, conflict, discrepancy, omission or other error in the Request for Proposals prior to submitting the proposal or any ambiguity, conflict, discrepancy, etc. shall be waived.

E. The City reserves the right to reject any and all proposals which are not responsive to the specifications of this RFP. Competitive negotiation requires that at least two responsive proposals for the same scope of work and service area be receive in response to the RFP. A competition is considered failed if only one responsive proposal is receive. If a competition has been declared failed, the City then has the option to reopen the procurement or enter into a non-competitive procurement.

F. At any time prior to the scheduled deadline for receipt of proposals, the Offeror may withdraw or amend its proposal by submitting a written request from the authorized representative whose name and signature appears on the proposal. A written request to withdraw or amend the proposal must be submitted to the individual and address to whom/which the proposal was submitted in accordance with the solicitation.

G. The City reserves the right to accept or reject, in whole or in part, any or all proposals submitted. The City shall reject the proposal of any Offeror that is determined to be non-responsive.

H. The City reserves the right to waive minor irregularities or informalities in an Offeror's proposal when the City determines that it will be in City's best interest to do so. Any such waiver shall not modify any remaining RFP specifications or excuse the Offeror from full compliance with the RFP specifications and other contract requirements if the Offeror is awarded the contract.

I. Offerors may be required to give an oral presentation of their proposal to City representatives for the purpose of clarification to assure the City's full understanding of the proposal. Oral presentations are an option of the City, at the City's sole discretion; however, no proposal may be altered or enhanced during an oral presentation.

J. No contract will be knowingly awarded to any organization which, in the City's sole discretion, is in arear to the City upon any debt or contract, or which is a defaulter as surety or otherwise under any obligations to the City, or which has failed to perform faithfully on any previous contract with the City.

K. All proposals shall be valid for a minimum of 120 days from opening date of the RFP.

L. Any proposal submitted to the City may be subject to Tennessee Public Records.

M. Brand names or trade names are given as a quality reference and aid vendors in offering the right quality for this solicitation. Except where said quality reference is followed by the world "ONLY", any proposal will be considered if, in the option of the City, the products are equal to those specified. PLEASE INDICATE BRAND AND MODEL PROPOSED.

N. The City is exempt from federal excise, state and local taxes on all purchases and will issue tax exemption certificates, upon request.

O. The submission of a proposal shall be taken as **prima facie** evidence that the Offeror has familiarized itself with the contents of the RFP and with these terms and conditions, in particular. The failure or omission by the Offeror to receive or examine this RFP shall in no way relieve the Offeror of any obligation with respect to its submission or of any term and condition of this RFP and may result in disqualification. In order to be deemed responsive, Offerors must provide responses to address all items in RFP.

P. The City discourages overly lengthy and costly proposals; however, in order for the City to evaluate proposals fairly and completely, Offerors should follow the format set out herein and provide all information requested. Proposals shall be as thorough and detailed as possible, but prepared simply providing a straightforward, concise description of the Offeror's capabilities to provide the services and satisfy the requirements of the RFP. Emphasis should be placed on completeness and clarity of the content.

Q. If awarded a contract pursuant to this RFP, the Contractor will be required to have and maintain the insurance specified in the RFP. The successful Contractor will be required to furnish the City, on or before the effective date of the Agreement, a Certificate of Insurance and/or policies attested by a duly authorized representative of the insurance carrier evidencing that the insurance required is in effect. All insurance companies must be acceptable to the City and be licensed in the State of Tennessee.

3. PROJECT 25 RADIO COMMUNICATIONS SYSTEM REQUIREMENTS

3.1. OVERVIEW

A. Respondents shall propose a complete 700/800 MHz, digital radio communications systems as described herein. Requirements for each system are described and delineated throughout this RFP according to trunked system requirements.

B. The system must operate in P25 Phase 1 and Phase 2 modes, with the transmission mode automatically selected by the system, based upon user radio capabilities and system programming.

C. The system must provide geographical coverage with sufficient capacity to meet the needs of first responders. The system must seamlessly integrate all sites such that end users can freely roam throughout the service area without interruption of service or the need to manually select sites. The proposed system shall maintain the subsystems of the current radio system.

D. The system shall provide portable and mobile radio coverage throughout the county as described in Section 3.5, Coverage.

E. The system shall provide packet data and packet data services, listed below.

1. Over-the-air Programming (OTAP)

2. Over-the-air Rekeying (OTAR)

3. Radio location services (i.e., global positioning system [GPS]/automatic vehicle location [AVL])

4. Text messaging

3.2. INTEROPERABILITY/P25 STATEMENT OF REQUIREMENTS

A. The proposed radio system shall comply with the latest applicable P25 suite of standards adopted as TIA and/or ANSI documents at the time of proposal submission (shown in Table 2 below). These standards establish technical parameters that allow compatibility and interoperability of digital radio equipment from different manufacturers.

B. By stating compliance with a level two heading in the Statement of Requirements (SoR), Respondents claim compliance with all applicable third-level headings (requirements) in the SoR. If a Respondent is not compliant with a requirement, the Respondent shall identify the requirement by number and name, and provide a detailed explanation of why the proposed system does not meet the requirement. It is understood standards have not been developed for each interface listed in the SoR.

C. Respondents shall reference the complete P25 SoR for a detailed description of each requirement; the following link is supplied for informational purposes only: http://project25.org/images/stories/ptig/docs/Technical_Documents/12131211_Approved_P25_SoR_12-11-13.pdf

3.2.1. *800 MHz P25 Phase 1 and Phase 2 Trunked Radio System*

A. Table 2, below, contains a list and brief description of second- and third-level requirement headings of the APCO P25 SoR. Each requirement in the table is identified as either mandatory or a standard option in the complete SoR, which is available at the link provided above. In order

to confirm compliance with P25, Respondents shall provide point-by-point compliance statements for each requirement in Table 2 for Phase 1 and Phase 2, 12.5 kilohertz (kHz) systems, as applicable.

Table 2 – APCO Project 25 Statement of Requirements, Mandatory and Standard Options

First Level Heading Description	Requirement No.	Service, Feature or Capability from the P25 SoR
Project 25 (P25) Overview	1.2.1	Bandwidth Compliance
	1.3.2	ANSI/TIA/EIA
	1.3.3	Subscriber Unit MIL-SPEC Requirements
Detailed Standards Suite Proposed	2.1.1	P25 Common Air Interface (CAI)
	2.1.2	P25 Standard Service Set
	2.2.1	P25 Mobile Data Interface (A Interface)
	2.2.2	P25 Fixed Host Data Interface (E_d)
	2.3	P25 Telephone Interconnect Interface
	2.4	P25 Inter-RF Subsystem Interface (ISSI)
	2.4.1	Multiple P25 RF Subsystem Connectivity
	2.4.2	Operational Modes
	2.4.3	Networking Configurations
	2.4.4	Bearer Media for Interconnection
	2.4.5	Services to be supported
	2.4.6	Interface Requirements
	2.4.7	Control Element
	2.4.8	Traffic Element
	2.4.10	Roaming Subscriber Management
	2.5	P25 Network Management Interface (NMI)
	2.5.1	Network Management
	2.5.2	Element Management
	2.6.1	CSSI[1] Applicability
	2.6.2	General CSSI Requirements
	2.6.3	CSSI Requirements for Conventional Services
	2.6.4	CSSI Requirements for Trunked Services
	2.6.5	CSSI Requirements for Mixed Mode Services
	2.6.6	CSSI Requirements Applicable to both Trunking and Conventional
	2.6.7	Miscellaneous CSSI Requirements
	2.7	P25 Fixed/Base Station Subsystem Interface (FSSI)
	2.7.2	Conventional Digital Fixed Station Interface (CDFSI)
	2.7.3	Trunked FSSI

[1] Console subsystem Interface (CSSI)

First Level Heading Description	Requirement No.	Service, Feature or Capability from the P25 SoR
P25 System Overview	3.1.1	Spectral Efficiency
	3.1.2	Channelization
	3.1.3	Roaming Functions of SUs and Mobiles within and among P25 Systems
	3.2.1	System Architectures
	3.2.2	System Connectivity
	3.2.3	ID Structures
	3.2.4	Throughput Delay
	3.2.5	Direct Modes of Communications
	3.2.6	Use of Standard Signaling
	3.2.7	Over-The-Air-Programming (OTAP)
	3.3	Support Audible Signaling
	3.3.1	General
	3.3.2	Operational or Systemic
	3.3.3	Operational Signals (Personality Programmed)
	3.3.4	Service and Bearer Channel Interface/Service Set
	3.3.5	Other System Functionalities
	3.3.6	Location Services Via GPS
Encryption	4.1.1	Type 3 Encryption Requirements
	4.1.2	Adopt for Type 1 Encryption:
	4.1.3	Key Fill
	4.1.4	Four Levels of Encryption
	4.1.5	Key Management
Subscriber Equipment	5.1.1	General Requirements
	5.1.2	Phase 1-Specific Requirements
	5.1.3	Phase 2-Specific Requirements
	5.1.4	Other General Requirements
	5.2.1	General VR[2] Capabilities
	5.3.2	Phase 2 Subscriber Units
Interoperability	6.1	Infrastructure
	6.2	Subscriber Units
Migration	7.1.1	General Migration Requirements
	7.3.1	Phase 1 Conventional to Phase 2 Migration Requirements
	7.3.2	Phase 1 Trunked to Phase 2 Migration Requirements

3.2.2. *Trunked P25 Interoperability*

[2] Vehicular Repeater (VR)

A. Respondents shall provide hardware, software, and services for P25 Inter-RF Subsystem Interface (ISSI) connections.

B. Direct P25 ISSI interoperability is contemplated with the Tennessee Advanced Communications Network (TACN), Collierville P25 Phase 2 system, Germantown P25 Phase 1 system, Bartlett P25 system, and Arkansas and Mississippi statewide systems. No definite arrangements have been made. Respondents should include ISSI server and per interconnected system licensing pricing.

C. The City intends the system to be open to all P25-compliant vendor equipment, including dispatch consoles. Respondents should include licensing and server pricing for Console Subsystem Interface (CSSI).

3.3. SYSTEM CONFIGURATION

3.3.1. *Redundancy and Survivability*

A. The proposed radio communications systems are intended to support mission critical operations; therefore, a high degree of redundancy and survivability is required. A network topology utilizing fault tolerance shall be incorporated to the greatest extent possible through a distributed and/or redundant architecture.

B. Redundancy is required for all system elements in which failure would result in a major failure of the system; single points of failure are not acceptable. Such elements include, but are not limited to:

1. System controllers and fixed site equipment

    a) Geo-redundant core controllers

    b) Geo-redundant simulcast cell controllers

    c) Network components, switches, and routers

2. Backhaul network – Reversible ring or monitored hot standby

3. Power systems

4. Network management and fault reporting systems

C. The trunked system shall have two geographically-separated system controllers.

D. Redundant simulcast control equipment is required for both Subsystem A and Subsystem B and shall be co-located at each site housing a system controller, or distributed among several simulcast subsystem tower sites.

E. The trunked system shall include several modes of degraded operation, known as failure modes. The system shall be capable of either manual or automatic activation of failure modes in the event of a failure. Additionally, the system shall switch to a failure mode gracefully. Respondents shall address how their system reacts to each failure mode and actions taken to maintain system operation. Failure modes shall include the following scenarios, at a minimum:

1. Loss of system (core) controller
2. Loss of simulcast/prime controller
3. Loss of single site
4. Loss of multiple sites
5. Loss of a frequency channel
6. Loss of backhaul connectivity between any two components

3.3.2. *Expansion*

A. The systems shall be expandable by adding additional hardware and/or software to increase coverage, capacity, or features. Where possible, Respondents shall propose equipment such that the system can be easily expanded by a minimum factor of 20 percent. For example, if a transmitter combiner requires five ports for the system design, a six-port combiner should be provided for ready expansion.

B. The trunked system shall be expandable to meet the capacities listed below through the addition of hardware and/or software. Replacement of the system and site control equipment to meet this requirement is not be acceptable.

1. Total radio frequency channels – 50
2. Total RF sites – 20
3. Unit IDs – 15,000 expandable to 20,000
4. Simultaneous affiliated users – 15,000
5. Talkgroups – 500

6. Radio Dispatch Console Positions – 55

3.3.3. *Trunked System Capacity*

A. The proposed systems shall consist of the following:

1. RF channels for Subsystem A – 20

2. RF channels for Subsystem B – 16

3. RF channels for the Locke site – 5

3.4. SITE SELECTION

A. Respondents shall determine the number and location of sites needed to provide the required coverage. The City has identified the existing radio sites for use in the proposed system, provided in Appendix C: Candidate Site List. The City would prefer, but does not require, these sites to be used; alternate sites may be identified if the Respondent believes it is in the best interest of the City.

B. If additional sites are needed, other government or utility owned sites, commercial sites for lease or new “greenfield” sites may be proposed. If alternate sites are identified, it will be the responsibility of the Respondent to ensure the identified frequencies are licensable at the proposed locations. It is also the Respondent’s responsibility to perform due diligence with the tower or land owner to determine availability of the site to accommodate the proposed antennas and/or tower and shelter (greenfield), and associated costs, zoning and planning restrictions, and document the availability and associated costs in its proposal. It is the City’s desire to operate radio sites that do not require lease payments wherever possible.

C. Respondents shall be responsible for the decommissioning, removal, and disposal of legacy equipment from existing City sites that are not used in the proposed radio system.

3.5. COVERAGE

A. The radio system shall be designed to provide highly reliable coverage within the geographical boundaries of Shelby County while meeting FCC and 700/800 MHz Region 39 Regional Plan restrictions and requirements for out-of-county signal propagation.

B. Coverage design, implementation, and testing for the system shall adhere to the TIA Telecommunications Systems Bulletin (TSB) #88-C or latest version, *Wireless Communications Systems Performance in Noise-Limited Situations*.

C. The City requires the radio systems to provide coverage as described below.

1. The radio system shall provide minimum mobile radio coverage of 95 percent within the county boundary with 95 percent reliability.

    a) Trunk lid mounted antennas should be assumed for all mobile coverage calculations.

2. The radio system shall provide portable radio coverage of 95 percent within the county boundary with 95 percent reliability. In addition, the system shall provide portable radio coverage of 95 percent within heavy buildings (equivalent to 20 dB).

    a) Portable configuration is with the radio on the hip in both transmit and receive modes using a Bluetooth or standard speaker microphone with a radio mounted antenna.

3. System coverage should be at a delivered audio quality (DAQ) of 3.4 or better, per TIA TSB-88C definitions of DAQ.

3.5.1. *Coverage Maps*

A. Respondents shall include a detailed description of the propagation models used and the assumptions made in preparation of the maps. A brief description of the methodology the software used to calculate coverage shall also be included in the proposal narrative.

B. Respondents shall submit both talk-out and talk-back system composite coverage maps for all proposed design configurations. The maps shall be clearly labeled and shall show system gain calculations for each of the following:

1. Mobile radios: Standard dash- or trunk-mount with antenna mounted in the center of the vehicle trunk lid.

2. Portable radios: Standard portable radio outdoors

    a) Talk-out to a portable radio on hip with belt holster

    b) Talk-back from a portable radio on hip with belt holster

    c) Round trip to/from a portable radio on hip with belt holster

3. Portable radios: Standard portable radio with 20 dB building penetration margin

a) Talk-out to a portable radio on hip with belt holster

b) Talk-back from a portable radio on hip with belt holster

c) Round trip to/from a portable radio on hip with belt holster

C. Coverage shall be depicted using a light transparent color or cross-hatching for those areas that meet or exceed the minimum coverage reliability threshold.

D. All maps must clearly delineate the difference between areas predicted to be greater than DAQ 3.4 equivalent coverage and areas that do not meet required coverage requirements. Respondents shall include the effects of simulcast interference in all coverage maps (if applicable).

E. Maps shall also reflect coverage areas where signal quality falls between DAQ 3.4 and DAQ 2.0.

At least one set of portable outdoor and mobile radio coverage maps shall be provided showing coverage extending outside the service area into surrounding counties, although the City acknowledges this is informational and not guaranteed coverage.

F. Coverage maps shall be provided in two formats:

1. 11-inch by 17-inch (minimum) full color hardcopy format

2. PDF file format on USB flash drive

3.5.2. *Map Criteria*

A. All maps shall include a background layer suitable for City reference (e.g., topographic map, roads, rivers, etc.). Link budgets shall be provided, clearly defining minimum information relating to each map and each site:

1. Base station/repeater RF power output

2. Antenna gain

3. Antenna model

4. Antenna mounting height and azimuth

5. Antenna down tilt (if applicable)

6. Transmit power and effective radiated power (ERP)

7. Receiver sensitivity
8. Transmit and receive antenna heights
9. Combiner/Multicoupler/Tower Top Amplifier (TTA) gains/losses of each
10. Transmission line lengths and line loss
11. Mobile and portable antenna height for talk-out and talk-back
12. Mobile and portable RF output power
13. Configuration of field units (e.g., talk-out to portable inside 20 dB loss buildings)
14. Simulcast timing parameters (if applicable)
15. Signal strength thresholds (in dBm)

B. Thirty-meter U.S. Geologic Survey (USGS), National American Datum (NAD)-83 terrain elevation data shall be used for coverage simulations. Alternatively, 3 arc-second data may be used where 30-meter data is not available.

3.5.3. *Coverage Model*

A. Respondents shall employ a suitable coverage prediction model using appropriate terrain and land cover data for the county environment. (Reference TSB 88, latest revision, for guidelines.)

3.6. SITE EQUIPMENT

3.6.1. *Overview*

A. All site equipment supplied shall be new, of high quality, designed to provide high reliability to support mission critical communications, and in current production.

B. The site equipment, or RF infrastructure, consists of the following components:

1. Simulcast equipment
2. Receiver voting
3. Repeaters/Base stations

4. Transmitter combiners

5. Receiver antenna multicouplers and TTAs

6. Antenna systems

3.6.2. *System and Site Control Equipment*

A. The system and site control equipment shall be capable of controlling all voice and data channels in the proposed system. The control equipment may use a distributed or centralized architecture.

B. The control equipment shall fully support APCO P25 functional requirements as outlined in Section 3.2 above, features and performance objectives, including Common Air Interface (CAI), ISSI, and CSSI.

C. Respondents shall fully describe the manner in which the proposed system and site controllers function and operate.

D. Since the system and site control equipment are so critical to the network, placement of the equipment at a secure, highly stable location is of the utmost importance. At this time the placement of the redundant core controllers is at the 79 Flicker Street shelter in Memphis and the Shelby Farms tower site.

E. Respondents shall define backhaul bandwidth requirements for each backhaul link within the network.

3.6.3. *Simulcast Equipment*

A. Respondents shall provide all necessary simulcast components and signal processing elements required to optimize voice quality in coverage overlap areas.

B. Non-captured overlap areas with delay spreads in excess of those required to meet the DAQ objective shall be minimized inside the service area.

C. Simulcast systems shall operate without the need for frequent manual optimization and system/subsystem alignment. All alignment and adjustments shall be automated where possible (e.g., signal conditioning adjustments for channel banks, signal launch times at sites, etc.).

3.6.4. *Receiver Voting*

A. Receiver voting equipment shall monitor all receivers in the simulcast system and select the best signal for processing and rebroadcast through the network.

3.6.5. *Base Station/Repeater Equipment*

A. General:

1. Repeater/Base station equipment shall be the vendor's top of the line, highest specification equipment, suitable for mission critical applications.

2. Repeater/Base station equipment shall be solid state in design and function with standard site conditions for temperature, altitude, and humidity.

3. Equipment shall interface to the Respondent's event monitoring and alarm system to allow remote viewing of the repeater operating parameters (e.g., power output, reflected power, received signal strength indication [RSSI], etc.).

4. Equipment falling below pre-determined operating parameters shall generate an alarm to the monitoring system.

5. The units shall be as compact as possible, with mounting configurations for standard relay rack or cabinets.

B. Base station equipment shall comply with Part 90 of the FCC Rules and Regulations, as well as appropriate EIA and similar agency standards and be an FCC-type accepted for the 700/800 MHz frequency band.

C. Prior to implementation, the selected Respondent shall perform the following studies at each site:

1. Intermodulation analysis – The selected Respondent shall consider equipment from all tenants located at the proposed site, per FCC licensed information and on-site observations of installed equipment.

D. The selected Respondent shall resolve all issues predicted during the intermodulation analysis studies. If an intermodulation problem is identified following implementation, the selected Respondent shall resolve the issue without degrading system coverage or performance, for a period of up to 12 months after final acceptance at no cost to the City.

E. Respondents shall include detailed specification sheets for all proposed equipment.

3.6.6. *Antenna Systems*

3.6.6.1. General Requirements

A. Respondents shall propose all antenna system equipment necessary for a complete design, including antennas, mounts, jumper cables, cable attachment hardware, grounding kits, and surge suppressors.

B. Antennas shall be of the appropriate gain and radiation pattern to provide the required coverage and comply with City licenses, applicable Region 39 requirements, and applicable FCC rules and regulations.

C. Transmission line type and length shall be appropriate to provide the required coverage with a minimum of signal loss. Antenna line shall be of the type to withstand at least 20 years of prolonged exposure to the environment in Shelby County without degradation.

D. Transmit combiner/Receiver multicoupler systems shall be engineered to provide optimum performance, least insertion and coupling loss, and maximum power and signal transfer to and from the antennas.

E. Transmit antenna systems shall be equipped with directional couplers to facilitate antenna system monitoring and troubleshooting.

F. Transmit antenna systems shall be equipped with transmit power output monitoring systems with alarms, installed at the output of each transmit combiner, to monitor forward and reflected power from the antenna, and provide alarm indications of antenna or feedline malfunction.

G. Receive antenna systems shall be equipped with tower top amplifiers with sufficient gain to overcome any cable losses. Tower top amplifiers shall be equipped with test cables to effect proper troubleshooting and performance analysis from ground level within the equipment room. The tower top amplifier shall be equipped with redundant low noise amplifiers and automatic amplifier switching in the event of primary amplifier failure.

H. Receive antenna systems shall be equipped with antenna multicouplers and low noise amplifiers to distribute the received signal to all receivers with no net signal loss. The multicoupler shall monitor the TTA and generate an alarm in the event of TTA failure or malfunction.

I. All antennas and antenna system components shall be rated for low Passive Intermodulation (Low PIM) by the manufacturer.

J. Respondents shall include detailed specification sheets for all proposed equipment, including but not limited to, antennas, receiver multicouplers, transmitter combiners, power monitors, and TTAs.

3.6.6.2. Antenna Installation

A. Antennas and cabling shall be provided and installed by the selected Respondent. Antennas shall be fed with the coaxial cable specified below.

B. The selected Respondent shall consider the transition between the current antennas and the new system antennas, allowing for a graceful migration between antenna systems with little or no loss of coverage to the legacy system.

C. The selected Respondent shall install antennas at the appropriate height and direction specified by the selected Respondent's engineer to provide optimum system performance. Antenna locations will be approved by City technical staff prior to installation. It should be noted that during the transition between systems, there may be a requirement for both old and new system antennas to be on the tower. Respondents are encouraged to consider this in planning both initial and final locations for the new antennas.

D. Vertical transmission lines shall be supported by an appropriate system to securely attach antenna transmission lines when installed on tower structures.

E. Antennas shall be installed in accordance with manufacturers' requirements.

F. Tower lighting cables shall not be bundled with transmission lines or other conductors anywhere within cable ladders or buildings' interiors.

G. Each transmission line run shall have entry port boots (inside and/or outside), lightning protectors and associated mounting brackets, and any additional jumpers required by the site-specific RF configuration. Transmission line kits should include the main line connectors, top and bottom jumpers, line grounding kits as needed, hoist grips, and weatherproofing materials.

H. Transmission lines shall be anchored to the tower using hardware recommended by the transmission line manufacturer for that type of tower.

    1. Spacing of anchoring hardware and attachment to the cable ladder shall be every three feet.

    2. Clamps and hardware shall be corrosion-resistant.

I. Cables shall be secured to the tower cable ladder and ice bridge trapeze with the appropriate cable hangers and hardware. The selected Respondent shall not use tie wraps, wire wraps, pieces of wire, tape, or similar temporary material to secure cables on the tower or ice bridge.

J. The transmission line support system shall run to the highest mounted antenna and allow for both old and new system cables.

K. The selected Respondent shall install and run RF jumpers from the internal surge protectors to the radio equipment in the shelter/equipment room.

L. Transmission lines shall be identified in a permanent manner using color coded bands, metal tags (or equivalent method) located at the antenna, at the bottom of the tower, at the shelter cable entrance, and inside the shelter or building.

3.7. DISPATCH CONSOLE

3.7.1. *General Requirements and Features*

A. Respondents shall provide pricing for replacement of all existing consoles with state-of-the-art IP-controlled consoles.

B. New consoles shall be provided at the following locations:

1. Memphis Police Communications – 22 positions
2. Memphis Police Real Time Crime Center (RTCC) – 1 position
3. Memphis Police Communications Backup – 22 positions
4. Memphis Fire Communications – 7 positions
5. Shelby County Sheriff's Office Communications – 8 positions
6. Shelby County Fire Communications – 4 positions
7. Memphis Emergency Management – 2 positions

C. Each of the above listed Agencies individually reserves the right to reject a Respondent's Dispatch Console solution and procure their own preferred dispatch console solution. Respondent will provide Project 25 Console Sub-System Interface (CSSI) server capacity and connectivity for any Project 25 CSSI compliant 3rd party dispatch console systems.

D. The dispatch console is a critical link for public safety personnel. It is here that the dispatch operator must relay critical information from the public to public safety personnel in the field. At times, the dispatcher may be in stressful conditions with lives at risk. It is imperative that the dispatch console be laid out in a manner allowing the operation of such console to be second nature to dispatch personnel. The dispatch console should provide the operator with as much information as necessary without the screen being cluttered and be easily navigated to perform necessary functions.

1. Dispatch console equipment (operator positions) shall be designed to be placed on modular workstation furniture and provide operators with an ergonomic design permitting ease of operation over extended periods, typically 8–12 hours for each operator. Ultra-slim form factor equipment is preferred to conserve workstation space.

2. Console positions shall be able to acoustically cross-mute channels in order to eliminate acoustic feedback between operators.

3. The ability to set a minimum volume level on a talkgroup shall be included.

4. The screen display shall be designed so that all dispatch functions shall be operable from one display.

5. The screen display shall be very flexible, allowing authorized personnel the ability to determine which functions are available at each operator position.

6. New features and screen configurations shall be supported through software programming and not reconfiguration of hardware.

7. Capability to program, store, retrieve, and edit multiple custom operator screens and configurations for each operator position shall be provided.

8. Operator screen configurations and an alias database shall be stored locally or on a centrally located server.

9. The dispatch console shall display an alias name on the screen when a unit with a radio identification (ID) stored in the alias database is transmitting.

10. Operator positions shall have the ability to decrypt and encrypt secure voice communications end-to end. Channels shall have a distinctive icon if encryption is being used for that channel.

11. Upon activation of an emergency alarm by field units, dispatch positions shall provide an audible alert, display ID of calling unit, and provide a visual alert and logging of an emergency activation.

12. Operators shall have the ability to utilize a headset or stationary gooseneck type microphone for transmitting audio.

13. Two headset jacks, capable of 4-wire or 6-wire headset operation shall be provided at each console position.

14. The capability to converse on 9-1-1 customer premise equipment (CPE) telephony utilizing the same operator headset that is used for radio conversations shall be provided.

15. An instant recall option shall be provided allowing the operator to verify his or her recent traffic. Playback shall be available on the operator position. Playback shall be for both radio and telephone.

16. A transmit audio level meter shall be provided showing the level of transmitted voice. This meter should also indicate the level of receive audio present on the selected channel.

17. Operator positions shall have the ability to independently set each channel's volume level. Minimum audio levels shall be capable of being set to avoid missed calls.

18. A control/indicator shall be provided to allow the operator to mute or unmute audio from unselected channels. Selected audio and unselected audio shall be audible from separate speakers.

19. A control/indicator shall be provided allowing the operator to select multiple channels allowing the dispatcher the ability to broadcast to several channels at once.

20. Operators shall have the ability to patch two or more conventional repeaters and/or base stations together so users may communicate directly. Operator positions shall be equipped such that a minimum of eight simultaneous patches shall be available.

21. Inter-console position intercom capability shall be provided. This capability will extend between dispatch centers as well as within any dispatch centers.

22. The dispatch console shall have transmit priority over Subscriber Units.

3.7.2. *Trunked Requirements*

A. Dispatch consoles shall be compatible with the proposed P25 trunked radio system. Dispatch consoles shall directly interface with single and multi-site trunked system controllers and shall allow interoperability between trunked and non-trunked channels in the system.

B. Dispatch consoles shall be able to monitor and transmit on all proposed and existing talkgroups within the trunked system. Talk groups appearing on the console positions shall be limited by programming by the system manager.

C. Dispatch consoles shall be equipped with an instant transmit switch for each talkgroup displayed.

D. In a trunked system with radio IDs, the Push-to-talk (PTT) ID or alias of the unit calling shall appear in addition to a call indicator. After the call is completed, the unit PTT ID or alias shall remain displayed until another call is received.

E. To aid dispatchers in a busy system, a list of the last 15 radio IDs shall be available in a recent call list.

F. In order to enhance dispatcher effectiveness in a PTT ID system, various display modes available shall interact as described below.

    1. An operator shall be capable of setting up (and subsequently knocking down) an emergency call from the dispatch console position.

    2. An option shall be provided to allow private communications between a dispatch console operator and a radio user. Once the operator is involved in a private call on a specific resource, it shall not receive audio from another radio attempting to call on that same resource.

    3. An option shall be provided that assigns priority to associated talkgroups. The dispatcher shall have the choice between normal preset priority and tactical priority, with tactical being the second highest priority for a talkgroup in a system.

G. It shall be possible to temporarily mute unselected talkgroups. The unselected audio shall unmute automatically after a programmable preset time. Mute shall be 20 dB minimum.

H. Dispatch consoles shall have the capability to patch two or more talkgroups together so users may communicate directly.

I. If the dispatcher attempts to make a call on a trunked radio system connected to the dispatch consoles and all trunked channels are busy, a visual and audible alert shall be initiated at the dispatch consoles.

J. The ability to compose and send free-form text messages shall be included.

K. The ability to alert an individual unit, activate an in–vehicle alert, and activate an external alert (horn honk, activate lights, etc.) shall be included.

L. The ability to interrogate a specific radio and key its transmitter to obtain situational awareness (remote monitor function) shall be included.

3.7.3. *Conventional Requirements*

A. Dispatch equipment shall include an instant transmit switch for each conventional repeater channel and/or base station.

B. On conventional resources capable of operating on multiple frequencies/modes, a control/indicator shall be provided to select the desired transmit frequency/mode (select channel). The select channel function shall cause the associated channel to switch frequencies/modes. Once a channel has been selected, the operator shall be able to transmit on this channel by pressing the footswitch or transmit button.

C. The dispatcher shall have the ability to remotely activate or deactivate the repeat function in a conventional repeater station.

3.7.4. *Alert Tones*

A. Consoles shall be capable of transmitting at least three distinctive alert tones indicating to field units the priority or type of dispatch to follow.

B. Consoles shall be capable of transmitting a “Channel Marker” tone to indicate to users that priority traffic or a priority situation is underway.

3.7.5. *System Integration*

A. The console system shall integrate with the following systems utilized by the City:

1. Proposed replacement Project 25 system covered by this procurement.

2. Mutual aid repeaters installed at the Armour Center tower operating on 8CALL90 and 8TAC91–94

3. TACN, a statewide 700 MHz P25 dynamic dual-mode trunked radio system

B. The dispatch console system shall support interfaces with the various CAD systems in use in Memphis and Shelby County to provide the ability for the CAD systems to automatically select recommended stations for dispatch. Consoles shall interface with the appropriate CAD system.

C. CAD Information

1. Memphis Police Communications – Hexagon (formerly Intergraph) Version 9.3

2. Memphis Fire Communications – TriTech

a) Memphis Fire Department uses CAD controlled Dynamic Regrouping to assign portable radios to Fire Ground Talkgroups for every multiple Apparatus Incident.

Respondent system will provide an Application Programming Interface (API) to allow the TriTech CAD to issue Regroup, Cancel Regroup, and other standard P25 subscriber control functions and commands automatically.

3. Shelby County Sheriff's Office Communications – Motorola Premier 1

4. Shelby County Fire Communications – Motorola Premier 1 (shared with Sheriff's Office Communications)

5. Memphis Public Works (Possibility) – Azteca Systems "City Works"

3.7.6. *Backup Control Stations*

A. Backup control stations shall be provided for each dispatch position at the five communications center locations. Respondents shall provide installation, configuration, and integration of backup control stations into the dispatch console system.

B. Backup control stations shall meet the requirements specified in Sections 11.3.3 and 11.3.4.

C. All components shall be properly grounded and installed with surge protection per standard industry practice.

D. Dispatch Tele-Communicators should not have to change headsets to use the backup control stations. Either the backup control station will be equipped with the same headset jacks as the Console position, or the backup control station must be integrated into the Dispatch Console User Interface.

3.7.7. *Logging Recorders*

A. Logging recorders are currently in place at each dispatch center. These recorders have recently been purchased and upgraded for interface with the current SmartZone system and 911 telephony. It is the desire of the City and County to re-use these recorders to log traffic on the new Project 25 system, if technically, operationally and economically practical.

B. Respondents shall familiarize themselves with the logging recorders currently in service at each dispatch center and provide in their proposal the most economic method of upgrading these recorders for operation with that respondent's Project 25 system solution. If not upgradable, respondents shall provide their replacement recording solution.

C. Logging recorders shall be evaluated at the following dispatch locations:

1. Shelby County Sheriff's Office Communications

2. Shelby County Fire Communications
3. Memphis Police Primary Communications
4. Memphis Police Backup Communications –New Facility
5. Memphis Fire Communications
6. Memphis Radio Repair Shop

D. For locations 1, 2, & 3 above, logging capabilities and recorder capacity shall be provided for each talkgroup available to a respective jurisdiction. Respondents shall provide a logging recorder system and archiving server compatible with the proposed system, and shall be responsible for interfacing the system resources.

E. Logging recording systems being proposed shall be capable of logging, at a minimum the following radio call meta data for each recorded transmission ;
   1. Date
   2. Time
   3. Duration
   4. Frequency/System channel designator
   5. Talkgroup ID
   6. Radio ID
   7. Radio Alias
   8. Inbound and Outbound traffic
   9. GPS Coordinates of the mobile or portable radio
   10. Text messages
   11. Status messages
   12. Private Calls
   13. Encrypted transmissions with the ability to play back the unencrypted message.

F. Respondents shall state the capabilities for their recording solution to record both P25 radio transmissions and current 911 telephone and future NG911 telephone calls on the same recorder. If separate recording systems are required for P25 radio and 911 telephony, respondents shall describe and price their separate recorder solutions.

G. Respondents shall describe their playback systems. If two recorders are needed for P25 radio and telephony, one common playback system is desired to access both recorders and play back both P25 radio and 911 telephone from a common playback terminal.

H. The Memphis Radio Repair logging recorder shall be capable of logging all trunked radio system traffic, including private calls and telephone interconnect calls. Since Memphis Fire

Dispatch, Police Backup Dispatch, and Radio Repair Shop are all located at 79 Flicker Street, a Logging Recorder system shared by, and serving all 3 entities, may be proposed.

I. Retention of recorded data is required for 12 Months. Respondents shall state the availability of long term storage servers, server capacity and length of retention time options for a system of size and traffic load as the Memphis/Shelby system.

3.7.8. *Operator Position Equipment*

A. All equipment supplied for use by the dispatch operators shall be capable of withstanding the 24 hours a day, 7 days a week environment of today's dispatch centers.

B. Operator position display monitors shall be provided as required by the individual dispatch centers:

1. Memphis Police – 24 inch Dell P2414H
2. Memphis Fire – 24 Inch LED
3. Shelby Sheriff – 21 Inch LED
4. Shelby Fire – 24 inch LED
5. Others – 21 inch LED

C. Keyboards shall be a standard 101-key keyboard at each position.

D. Operator functions shall be executed by positioning a screen pointer (cursor) over the appropriate icon and pressing the mouse button.

E. Trackball mouse.

F. Headset jacks and headsets shall be provided allowing the operator to hear select audio via a headset and allowing the operator to respond via a microphone attached to the headset. The headset plug inserted into the jack shall automatically disconnect the console's microphone and mute the select speakers.

G. Two jack boxes shall be provided and installed per dispatcher position.

H. A heavy-duty footswitch shall be provided to allow the operator to key the selected channel hands-free.

I. Personal computers (PCs) supplied shall be capable of providing a graphical user interface (GUI) using the Microsoft® Windows Operating System, and be capable of local area network (LAN) client-server architecture for network access.

J. PCs supplied shall be based on present state-of-the-art PC technology.

3.7.9. *Common Electronics Equipment*

A. The common electronics equipment shall contain all equipment necessary to route audio and control signals between the dispatch operator positions and the proposed P25 trunked system.

B. The common electronics equipment shall be capable of controlling the proposed P25 trunked system.

C. The common electronics equipment shall not have a single point of failure. Redundant switches, routers, cards, and power supplies shall be provided.

D. The common electronics equipment shall be connected to the radio system directly through the radio system IP network; RF control stations shall not be used as primary connection to the radio system.

E. The common electronics equipment shall allow for a remote dispatch position. This remote dispatch position shall be connected via a LAN/wide area network (WAN) connection.

3.8. SOFTWARE-BASED CONSOLES – OPTION

A. As an option, Respondents shall provide a software-based console solution capable of being installed on a laptop or desktop PC.

B. It is preferred that this solution support both direct network wireline interface as well as wireless Wi-Fi, Third Generation (3G), or Fourth Generation (4G) connectivity.

C. Respondents shall include literature and pricing on their specific application as an option.

3.9. PUSH-TO-TALK OVER CELLULAR

A. Respondents that offer a PTT over Cellular application for smartphone interface to a P25 trunked system shall provide the detail specifications and costs for the PTT over Cellular gateway and licensing for the user smartphone gateway access and applications.

3.10. NETWORK EVENT ALERTING AND MANAGEMENT SYSTEM

A. This section provides specifications and requirements for an integrated monitoring and control system for local and remote site facilities and equipment. The system is used to provide remote indication of the status of all system equipment, alarms, system equipment conditions, digital and analog values, and to provide remote control relay operations.

B. All control functions and alarms from towers, shelters, and backup power shall be interfaced to the NMS, detailed herein, for remote control and monitoring.

C. The system shall acquire, process, and display information in an integrated and uniform fashion for a variety of critical systems, including:

    1. Trunked and conventional radio systems

    2. Local and remote site facilities

    3. Primary and backup power systems

    4. Microwave, leased line, and data networks

D. Any change in state of site equipment shall induce an alarmed state. Equipment monitored shall include, but not be limited to:

    1. Repeater/Base station operating parameters and alarms

    2. Antenna system power sensors and monitoring systems

    3. Microwave radio operating parameters

    4. Power fail

    5. Heating, ventilation, and air conditioning (HVAC)

    6. Smoke detector

    7. Intrusion detection

    8. High temperature

    9. Low temperature

    10. High humidity

    11. Uninterruptible power supply (UPS) fail

    12. UPS state (normal or bypass)

    13. Generator (including generator run, low fuel, high temperature, fail, etc.)

14. Generator not in auto

15. Transfer switch (normal or bypass state)

16. Surge arrestors

17. Impedance change of site grounding system

E. Where accommodated by the specific equipment, the NMS shall accommodate the ability to interrogate and read various operating parameters of the equipment, including transmitter power output, reflected power, RSSI, and other monitored operational functions.

F. NMS components include:

1. Network Management Terminal (NMT)

2. Remote Terminal Units (RTUs)

3. Interface application to paging, e-mail, and short messaging systems to provide alerts and notification of alarms to on-call maintenance personnel

a) This interface application shall be programmable to designate the level of alarm notification to be sent.

3.10.1. *Network Management Terminal*

A. The NMT shall provide primary processing, display, and control of information to and from a variety of RTU locations. System status and alarm conditions shall be displayed. The system shall provide the ability to remotely access the system to activate and deactivate user radios, check the operational status of the system and view alarms.

B. NMTs shall be installed at the following locations:

1. Memphis Police Radio Shop – 79 Flicker Street

2. Primary Core Equipment Shelter – 79 Flicker Street

3. Redundant Core Equipment Shelter – Shelby Farms Tower, Mullins Station Road

4. Shelby County Sheriff's Office Radio Shop – Arlington Substation

5. System A Prime Site – 201 Poplar St

6. Fire Alarm Office – 79 Flicker Street

C. The NMS shall be equipped to allow remote access from an external location via laptop for troubleshooting and after-hours alarm response, interrogation, and maintenance.

D. Respondents shall fully describe their proposed network management and monitoring systems, parameters monitored, and proposed network architecture, with block and system diagrams.

E. The NMT shall meet the general requirements listed below.

1. Expandable software and hardware architecture shall be easily updated by adding software modules and hardware boards.

2. Hardware and software platforms shall be PC- or laptop-based using current versions of hardware and software.

3. Licensing shall be supplied to support simultaneous use of all NMTs.

4. Both graphic and tabular displays shall provide instantaneous and comprehensive network status information.

5. The NMT shall provide full archiving and control functions.

6. Multiple alarm protocols for higher level NMSs shall be mediated by the NMT.

7. The NMT shall be designed to monitor a large cross-section of equipment so that it can consolidate multiple alarm systems rather than just poll alarms from RTU locations.

8. The NMT must perform full management functions with a local terminal.

9. The NMT shall provide e-mail notification of alarms.

10. The NMT shall provide alarm filtration and consolidation.

11. A web browser interface shall be provided for common management functions.

12. A secure web browser interface shall be provided to monitor alarms and perform control and management functions remotely via intranet or Internet.

F. Standard Features:

1. Programmable display screens, including:

a) System Summary – High-level screen summary window with links to other screens

b) Change of State – Summary of points that have changed state from alarm to normal or normal to alarm

c) Standing Alarms – Summary of all points in alarm condition

d) Programmable Alarm Windows – Allows logical grouping of alarms such as by type or site

2. Graphic depiction of the network allowing annunciation and point selection via icons:

    a) Nested tree depiction of the network with drill-down capability

    b) Capability to drive external display devices

3. Programmable console environment, including:

    a) Database definition

    b) Screen colors

    c) Alarm summary formats

    d) Blink attributes

    e) Pager alarm formats

    f) Audible alert formats

4. Support of the following status points:

    a) Simple status – Contact open or closed

    b) Change detect – Simple status plus change detect since last scan

5. Support of the following control points:

    a) Direct control

    b) Select before operate

c) Batch – Control multiple relays with a single operation

6. Display the value of a monitored quantity such as temperature, fuel level, voltage standing wave ratio (VSWR), etc.

7. Time stamp indicating date and time of message within 0.5 seconds

8. Conditional assignable text messages (minimum 256 characters) for each point to be issued on a change of state or alarm

9. On a point basis, programmable delay before alarm is issued

10. On a point basis, the ability for the operator to deactivate an alarm to inhibit additional annunciation

11. Support alarm history:

    a) Logging of all alarms to disk and printer (selectable)

    b) Minimum history log of 500,000 entries

12. Support text message of alarm sent to e-mail lists

13. Support ping interrogator to confirm that servers, routers, and IP-based equipment are physically present on the network

14. Support editor to provide point configuration utilities to create and edit point databases

15. Multiple levels of user name and password protection to all for flexible system management

3.10.2. *Remote Terminal Units*

A. RTUs shall be provided in sufficient quantities to monitor the entire network, including:

1. Trunked and conventional radio network components

2. Site facilities including shelter, tower, lighting, power, and generator

3. Microwave radios, channel banks, etc.

4. Data network equipment including routers, switches, etc.

5. Other equipment as required

B. RTUs shall be fully compatible with the NMT supplied and provide complementary functionality wherever necessary to provide a complete working system.

C. RTUs shall support the following points:

1. Status/alarms – 48 minimum, expandable to 256 points

2. Control outputs – 8 minimum, expandable to 32

3. Analog inputs – 8 minimum, expandable to 16 (optional)

D. RTUs shall support time stamp and system time synchronization.

E. Terminations for all alarm points shall be provided on suitable terminal blocks providing ease of installation, testing, and maintenance.

3.11. SOFTWARE LICENSING

Project 25 systems have evolved as software defined and managed systems. All major system components and user equipment are firmware and software based, using software driven applications to provide system and user radio operating features and capabilities.

3.11.1. *License Term*

Respondents shall propose software and firmware licensing costs for all system components and user equipment. The term of licenses shall be for the time the proposed system(s) are in use by the City, with no renewal or additional licensing fees.

3.11.2. *License Transferability*

In the event of the failure, loss, catastrophic damage or other event which renders any software/firmware driven system component useless and requires replacement of that component or radio, the software and firmware licenses shall transfer to the replacement component or radio at no cost to the city.

4. BACKHAUL NETWORK

4.1. OVERVIEW

A. Respondents shall propose a detailed fault-tolerant backhaul microwave radio network with a throughput of 155 megabits per second (Mbps) capacity on each link.

B. The radio sites identified in Appendix C, Candidate Site List, should be utilized for proposal purposes in addition to any additional sites proposed by the respondent.

C. The minimal acceptable antenna height at each location should be utilized. Any variations in the radio infrastructure design will be negotiated with the selected microwave vendor at a later point.

D. The proposed network shall support both TDM and Ethernet traffic simultaneously.

E. The microwave network is required to support both the legacy and proposed radio systems. It is the City's intent to implement the new microwave system before transitioning from the legacy radio system.

4.2. DIGITAL MICROWAVE NETWORK

A. The digital microwave network consists of the following components:

1. Point-to-point digital microwave radios
2. Microwave antennas
3. Antenna systems
4. Channel bank (multiplex) equipment, if needed
    a) It is assumed the existing channel banks may be used.
5. System alarms

4.2.1. *Requirements*

A. The digital microwave backhaul network shall consist of monitored hot standby (MHSB) or ring-protected point-to-point licensed microwave hops.

B. Microwave terminal equipment shall include transmitter, receiver, modem, power supply, automatic switching device, multiplexer, service channel(s), and all associated interconnections to provide a complete and functional system.

C. The equipment shall be the type accepted for licensing under Part 101 of the FCC Rules and Regulations.

D. Microwave terminal equipment shall be the vendor's top of the line, latest state-of-the-art equipment. Equipment obsolete requirements per Sections 1.6 B and C of this specifications document shall apply.

E. The microwave radio shall deliver two-frequency, full-duplex operation. Space diversity configurations are acceptable if necessary to meet reliability requirements.

F. Capacity:

1. Each hop shall be equipped for the proposed radio network requirements and existing legacy radio system channels as applicable.

2. Each hop shall deliver a minimum payload capacity of 155 Mbps, or more as required to serve the proposed network. Respondents shall fully describe methodology for equipping radios to full capacity (e.g., software upgrade, additional channel bank equipment, etc.).

G. Performance Objectives:

1. Each microwave hop shall be designed to meet or exceed a one-way end-to-end annual reliability and availability of 99.999 percent at the required capacity of 155 Mbps.

2. Each microwave hop shall be designed to meet or exceed a one-way end-to-end annual quality performance (bit error rate [BER] = 10-6) of 99.999 percent at the required capacity.

H. Frequency:

1. The current microwave system is licensed as constructed in the 6 GHz spectrum block. It is anticipated that the current spectrum will be reused if the path points are unchanged in a Respondent's system design.

2. The current microwave link between Fire Station #7 and 201 Poplar St operates in the 18 GHz band. This link has been subject to rain fade during storms. Respondents should propose alternate frequency and system configuration solutions to improve the reliability of this path.

3. If the system configuration changes, the selected Respondent shall be responsible for all microwave frequency research, prior coordination, and preparation of all associated FCC license applications and submittals on behalf of the City.

4. The City shall be responsible for coordination fees and licensing fees, if any, and signatures, if applicable.

5. Respondents shall propose the most appropriate licensed frequency band for each hop based on the requirements and FCC Part 101 regulations.

I. Transmitter:

1. Respondents shall provide transmit output power referenced to the antenna port.

2. Transmit output power shall be software-adjustable.

3. Automatic transmit power control (ATPC) shall be available.

4. A switch from main transmitter to standby transmitter shall not result in system outage. Respondents shall describe expected switchover time.

5. Radios shall be equipped with redundant power amplifiers. Switching between power amplifiers shall not result in system outage.

J. Receiver:

1. Respondents shall provide guaranteed receiver threshold.

2. Respondents shall provide performance criteria of the proposed radios for the following:

   a) Co-channel interference

   b) Adjacent channel interference

   c) Dispersive fade margin

3. In a monitored hot standby configuration, the receivers shall be configured so as to ensure that the receiver with the better performance is operational at any given moment. Respondents shall equip radios with a protect channel loss or RF branching loss to prevent frequent switching.

4. Transfer to the backup receiver shall not result in system outage.

K. Antenna System:

1. Microwave antennas shall be compatible with the radio frequency bands and conform to applicable FCC requirements. Solid parabolic-type, Category “A” antennas shall be used in accordance with FCC Part 101.115.

2. Pressurized elliptical waveguide shall be used. Connectors shall be standard, premium-type, and compatible with antenna and radio EIA interfaces.

3. All mounting brackets, connectors, and other hardware shall be supplied as necessary for a complete installation.

4. An automatic dehydrator/pressurization system shall be provided to maintain at least 5 pounds per square inch gauge (psig) positive pressure of conditioned air in the elliptical waveguide and antenna feed unit. Individual pressure gauges on a distribution manifold shall be provided for each line.

5. All installed antenna/transmission lines shall be purged, pressure tested, and tested for low VSWR using return loss measurements.

6. All RF paths shall be tested to demonstrate proper antenna alignment by measuring the net path loss between sites as measured at the equipment rack interface.

7. All antenna sweep testing results shall be documented and provided in the as-built documentation at each site.

L. Channel Bank:

1. Existing TeNSr 800 channel banks shall be reused in the proposed microwave system.

2. If necessary, Respondents shall provide multiplex equipment (M13 mux) to convert DS-3 signals to 28 DS-1s. All M13 multiplex equipment shall be capable of drop and insert of individual DS-1s in order to fully utilize a DS-3 across the entire network.

3. All multiplex equipment shall be equipped with standby switching and alarms. The equipment shall also be capable of remote alarm/control.

M. Network Management:

1. Respondents shall fully describe alarm, monitor, and control capabilities of the microwave terminal equipment, including capacity for external alarms (e.g., door alarms, generator, etc.).

2. Alarms and controls for the microwave system shall be integrated into the overall NMS specified in Section 3.10. Respondents shall fully describe the nature of the interface between the systems.

N. Power:

1. A direct current (DC) power subsystem shall be provided for each microwave terminal.

2. The current microwave system utilizes a -48 volt DC (VDC) power system. Respondents shall familiarize themselves with this system and provide any additional rectifiers and circuit breakers needed to accommodate their proposed equipment.

4.2.2. *Microwave Engineering*

A. Respondents are encouraged to familiarize themselves with the current system configuration. Since the system is being totally replaced, Respondents are encouraged to submit alternate configurations that would increase reliability, redundancy, and provide reduced cost.

B. The selected Respondent shall conduct physical path surveys to assure that all proposed paths meet proper clearance criteria.

C. The selected Respondent shall also conduct site visits at all sites and notify the City of any site modifications necessary for the microwave equipment or antennas.

D. The selected Respondent shall provide antenna centerline mounting height recommendations, based upon the information gathered during the physical path surveys and site visits.

E. Respondents shall include fade margin calculations with the proposal, showing the preliminary antenna sizes, system gains, and system losses.

4.3. SOFTWARE LICENSING

Microwave systems have evolved as software defined and managed systems. All major system components and user equipment are firmware and software based, using software driven applications to provide system and user radio operating features and capabilities.

4.3.1. *License Term*

Respondents shall propose software and firmware licensing costs for all system components and equipment. The term of licenses shall be for the time the proposed system(s) are in use by the City, with no renewal or additional licensing fees.

4.3.2. *License Transferability*

In the event of the failure, loss, catastrophic damage or other event which renders any software/firmware driven system component useless and requires replacement of that component or radio, the software and firmware licenses shall transfer to the replacement component or radio at no cost to the city.

5. FLEET MAPPING

A. The selected Respondent shall develop the fleet map in coordination with the individual agencies of Memphis and Shelby County.

B. The selected Respondent shall develop the actual fleet map with input and direction from the City. The fleet map shall contain at a minimum:

1. Security group partitioning
2. Unit ID range assignment
3. Talkgroup ID assignment
4. Agency identification
5. Emergency actions
6. Encryption capability
7. Roaming capability
8. Priority
9. Network infrastructure
10. Failsoft channel/frequency assignment

C. The selected Respondent shall also develop subscriber programming templates. These templates shall have the basic features and functions defined for a particular subscriber and user type. Templates shall be developed on a per agency basis.

D. Once the fleet map and templates are approved and completed, the selected Respondent shall use these for installation of subscribers and for further configuration of the system. The selected Respondent shall submit these with the final as-built documentation.

E. Upon completion of the fleet mapping process, the selected Respondent shall proceed to populate the system user authentication, alias, and operational databases with the required data.

6. SITE DEVELOPMENT (IF REQUIRED)

6.1. GENERAL

A. The radio sites identified in Appendix C, Candidate Site List, are the sites preferred by the City. Respondents shall use these existing sites and infrastructure to the greatest extent possible.

B. If additional sites are required to meet a Respondent's system design, Respondents may propose additional sites.

C. The requirements detailed in this section shall apply to any work proposed at existing sites and to any new construction or leased sites, as applicable.

D. If additional sites are proposed, Respondents shall provide evidence in their proposal of due diligence in vetting and qualifying the tower locations as available and having the capacity needed. This includes interviewing the land, building, or tower owner to determine and document the willingness to lease the land, property, building, or tower space; and verifying the capacity of the building or tower to accommodate the needed antennas and ground space for the required size of shelter and tower. Documentation for each proposed site shall be included in the Respondent's proposal.

E. Respondents shall be responsible for building/construction permitting including zoning, National Environmental Policy Act (NEPA), Tribal and State Historic Preservation Office (SHPO) filings as well as any other required permits.

F. Shelby County is in the New Madrid Fault seismic zone. All site structures, towers, shelters and related tanks, generators, and fences shall be designed for use and survivability in this seismic zone and, as such, properly installed.

G. Respondents shall identify and propose any additional work necessary, including, but not limited to:

1. Towers
2. Shelters
3. Backup power

4. Site preparation

5. Fencing

H. During preliminary design, the selected Respondent shall provide detailed drawings including all structures and foundations, sealed by a professional engineer (PE) registered in the state of Tennessee.

1. Detailed dimensional drawings showing all system components and locations

2. Drawings and/or specifications describing any auxiliary equipment

3. Manufacturer slick sheets of all equipment used

I. Code Compliance:

1. Installation of all electrical equipment, power distribution, lighting assemblies, and associated wiring shall comply with the most recent edition of NEC® and Occupational Safety and Health Administration (OSHA) regulations, local codes, and ordinances.

2. All electrical equipment shall be listed or approved by UL.

3. The selected Respondent and any subcontractor employed by the selected Respondent shall comply with all local codes and industry best practices and guidelines stipulated in Section 1.71, Standards and Guidelines, of this specifications document.

J. Prior to any excavations, the selected Respondent or subcontractor shall follow appropriate procedures for notifications outlined at the following website: www.call811.com.

K. The selected Respondent shall coordinate with utility companies for all utility-related items, such as electrical service hookups and disconnects.

L. Concrete:

1. For all foundations and concrete work, the selected Respondent or subcontractor shall provide to the project engineer a test sample of each mix of concrete demonstrating that it has been tested for compliance with the foundation specifications set forth by the requisite site engineer. Written reports certifying the strength of the concrete are to accompany each test cylinder.

2. If any concrete used in the foundation does not meet specifications, the selected Respondent or subcontractor shall remove the foundation and pour a new foundation using compliant materials, at no expense to the City or site owner.

6.2. TOWERS

A. General:

1. If a Respondent determines additional towers are required or existing towers must be replaced, the Respondent shall propose a self-supporting tower.

2. Any tower manufacturer supplying a tower(s) for this system shall guarantee structural integrity of the tower for a period of not less than 20 years from the date of acceptance.

B. Tower Loading:

1. The tower and foundation shall be designed for all proposed equipment, legacy equipment, appurtenances, ancillary equipment, and initial antenna loading plus 25 percent future antenna system growth, without addition to or modification of the finished tower or foundation.

2. The proposed tower structure shall be designed and installed in accordance with latest revision of TIA 222 *Structural Standard for Antenna Supporting Structures and Antennas*, Class III usage class.

C. Proposed towers shall include:

1. Ice Bridge:

a) A horizontal transmission line ice bridge, extending from the tower cable ladder to the equipment building entry port, shall be provided.

2. Transmission Line Support:

a) A vertical transmission line support system shall be provided to securely attach the antenna transmission lines.

b) Holes shall be provided in the tower support members, tower hanger adapter plates, or separate cable ladder structures to allow installation of snap-in cable hangers and bolt-in cable hangers at maximum 3-foot intervals. The mounting holes shall be precision punched or drilled and sufficiently separated to accommodate the snap-in or bolt-in hangers.

3. Climbing Access:

a) A ladder, beginning at a point at least ten feet off the ground, shall be provided as an integral part of the tower to permit access by authorized personnel.

b) The tower shall be equipped with an OSHA-approved anti-fall safety device in accordance with TIA 222-G. This device must not interfere with the climber's ease of reach by hand or foot from one rung of the ladder to the next, either going up or coming down.

c) Two safety climbing harnesses shall be supplied with each new tower.

4. Lighting:

    a) Tower lighting shall be supplied as required by the applicable determination as issued by the FAA for this project and be fully compliant with FAA Advisory Circular (AC) 70/7460-1L, Obstruction Marking and Lighting, latest revision.

    b) The system control circuitry shall provide synchronization and intensity control of the obstruction lighting system and shall monitor the overall integrity of the lighting system for component failures or improper operation.

    c) The lighting system shall employ Light Emitting Diodes (LED) technology and not incandescent or flash tube technology.

    d) The selected Respondent shall wire all alarms to a Respondent-provided Type 66 block located in the communications shelter or equipment room. All alarms shall be clearly labeled.

5. A lightning ground rod shall be installed at the very top of the tower to extend at least two feet above the top of the tower or lighting fixture.

6. Permanent labeling shall be clearly provided and attached near the base of all new towers for the following:

    a) Manufacturer

    b) Model

    c) Serial number

    d) Tower height

    e) Latitude and longitude

f) FAA and FCC identification numbers (if applicable)

D. Construction:

1. All welding must be done in the factory prior to the galvanizing process. Field welding is not acceptable.

2. The tower shall be constructed of high-strength steel. All components and hardware shall be hot-dip galvanized with zinc coating per EIA standards after fabrication. A zinc coating shall be permanently fused to the steel, both inside and outside, so all surfaces are protected and no painting is required for rust protection.

3. Prior to galvanization, each and every piece of steel and every weld must be deburred and smooth finished.

E. Upon completion of the work, documentation detailing final inspection and testing shall be submitted, documenting the items below.

1. Steel structure:

a) Vertical alignment and plumbness

b) All bolts tight and torqued to specification

c) No damaged or missing structural members

d) All surface scratches and damage to the galvanization repaired

e) No signs of stress or vibration

f) All climbing ladders and other devices installed correctly

g) Labels and tags completed and installed

2. Foundation:

a) Concrete finish/lack of cracks/blemishes

b) Grouting, if used, has drain holes if the tower uses hollow leg construction or monopole design

c) Backfilling and grading

3. Grounding:
    a) Lugs and CADWELD®s verified
    b) Ground resistance test and record
    c) Ground lightning rod installed at top of tower
4. Ice bridge:
    a) Installed per specification
5. Lighting and controls:
    a) Conduit and wiring installation inspected
    b) Proper lamp operation verified
    c) Alarm contact operation verified
    d) Labeling verified
6. Photographs:
    a) Overall structure from north, east, south, and west
    b) Footers
    c) Grounding

6.3. SHELTERS

A. General:

1. Respondents shall propose a new equipment shelter at new site locations and when existing shelters are deemed inadequate.

2. The shelter shall be prefabricated and preassembled. The shelter shall be constructed from concrete and/or aggregate materials.

3. Respondents shall propose, as an option, shelter-mounted security cameras. Cameras shall utilize the IP-based microwave network for data transport. Backhaul capacity

requirements shall be provided by the Respondent. Supporting camera monitoring equipment shall be located at the Memphis RTCC.

B. Size:

1. Shelter dimensions shall be determined by the selected Respondent dependent upon final design. Legacy and proposed systems shall use up to 60 percent of the floor space, leaving a minimum of 40 percent for future expansion.

2. Minimum shelter size shall be 24-foot by 24-foot with a minimum interior height of nine feet.

C. Generator Room:

1. The shelter shall be configured with a separate room to house a 100 kilowatt (kW) diesel-fired generator.

2. The generator room shall be equipped with fresh air and exhaust vents in addition to accommodating the generator engine exhaust pipe.

3. Fire and intrusion alarm sensors shall be installed in the generator room and tied to the shelter alarm system.

D. Foundation:

1. The foundation for the shelter shall consist of concrete piers or a poured concrete slab constructed by the selected Respondent that will properly support and secure the shelter.

2. Foundation drawings recommended by the shelter manufacturer shall be the criteria by which the foundation is constructed.

E. Flooring:

1. Respondents shall propose a structure where the floor or solid foundation features a minimum uniform load rating of 200 pounds per square foot with no more than 3,000 pounds over any four square foot area. This rating shall be increased in sections as necessary to support heavy weight equipment. The floor shall exhibit a minimum 90 pounds per square foot uniform live load capacity while the building is being lifted.

2. Floors shall be insulated to a minimum R-11 rating. Insulation shall be secured in place to prevent shifting during construction and transportation.

3. Exterior covering of the floor shall be included to prevent rodent penetration.

4. The floor shall be covered by a high quality, industrial/commercial-grade asphalt or vinyl tile. All edges shall be covered by wall molding.

F. Walls:

1. Walls shall be constructed to a minimum 120 mile per hour (mph) wind loading, including overturning moments.

2. Walls shall withstand the effects of bullets or other projectiles equivalent to a 30.06 high power rifle load fired from a distance of 50 feet with no penetration to the inner cavity of the wall. No interior damage shall be sustained including insulation, interior walls, etc.

3. The outside walls shall be finished concrete or an aggregate composition.

4. A wall feed-through with 12 each, 4-inch openings shall be provided on the tower side of the building to accommodate elliptical waveguide and coaxial transmission lines. The openings shall be properly booted to provide a good weather seal. The wall feed-through shall be bonded to the site ground system per guidelines specified in Section 1.7.1, Standards and Guidelines, of this specifications document.

5. The inside walls shall be finished with minimum $^{5}/_{8}$-inch plywood (or equivalent) to allow mounting of panels, blocks, etc., and trimmed with coordinated molding.

6. High performance insulation shall provide a minimum insulation factor of R-11.

G. Roof:

1. The building roof shall support a minimum 100 pounds per square foot uniform live load.

2. The roof shall be pitched to facilitate run-off of water.

3. The shelter roof shall withstand the impact of ice falling from the adjacent tower without suffering any damage or shall otherwise be protected from such damage. Respondents are to describe in their proposal how this requirement shall be met.

4. High performance insulation shall provide a minimum insulation factor of R-19.

H. Door:

1. Shelters shall have one 42-inch by 84-inch insulated door, with three stainless steel tamper-proof hinges, passage-style lever handle, deadbolt lockset, and steel or

fiberglass weather hood or awning. The door shall be equipped with a hydraulic door closer.

2. The exterior door shall be of aluminum or steel (stainless or galvanized) construction with a finish to match the building finish.

3. The door shall withstand the effects of bullets or other projectiles equivalent to a 30.06 high power rifle load fired from a distance of 50 feet with no penetration to the inner cavity of the door. No interior damage shall be sustained including insulation, interior walls, etc.

4. The door sill shall be of stepped construction so as to prevent rain water from entering the shelter at the bottom of the door or from around the door frame. The door frame shall have a weather seal around the door to limit air and water intrusion.

I. Finishing:

1. Respondents shall describe the interior and exterior finishes. Color and finishes shall be selected by the City from samples provided by the selected Respondent.

2. All joints shall be sealed with a compressible, resilient sealant.

J. Alternating Current (AC) Power System:

1. The selected Respondent shall deliver the building complete with a 400 ampere capacity, 240 volts, three phase electrical panel box with a ground bar.

2. This panel shall be equipped with a 400 ampere capacity main circuit breaker used to supply power for all electrical functions related to the site.

3. Overall panel size shall be determined by the need to provide the number of individual breakers required plus a reserve of at least six 240-volt slots.

4. Breakers for shelter air conditioning shall be of the bolt-down, not snap-in, type.

5. Receptacles:

a) Each radio equipment unit (or rack) shall be supplied with two 20 ampere circuits, each terminated at a typical NEMA 5-20 twist lock receptacle. Receptacles shall be mounted to the side of the overhead cable tray.

b) Service receptacles shall be mounted on the walls at six-foot intervals or less.

c) One weatherproof ground fault interrupter (GFI) exterior power receptacle shall be provided with each shelter, to be mounted near the air conditioning units.

d) Each receptacle shall be fed from an individual breaker. The feeding breaker shall be identified at the receptacle and the receptacle shall be identified at the breaker. All breakers or circuits shall be 20 ampere, unless otherwise noted.

K. Power Line Surge Suppression:

1. AC surge protector shall be provided and installed inside the shelter.

2. Minimum surge protector requirements are as follows:

a) Built-in redundancy of dual stages per phase with filtering

b) Metal oxide varistor (MOV) and Silicon Diode (SAD) protection devices installed

c) Surge energy shunted to ground, not to neutral

d) Front panel indicator lamps

e) Remote/local status contacts

f) Fusible link protected so as not to interrupt power

g) Field replacement protection blocks, fuses, if needed

h) UL-listed components

i) 45 KA per phase ANSI C62.1 8/20 waveform

j) Electromagnetic interference (EMI)/radio frequency interference (RFI) filtering per Mil-STD-220

3. The unit shall be capable of handling the full 240 volt, 400 ampere capacity of the electrical system.

L. Wiring Methods:

1. All wiring noted on the site drawings or otherwise included by the selected Respondent shall be installed in conduit or ductwork. Where no protection method is specified, conduit shall be used.

2. All conduits and ducts shall be securely surface-mounted and supported by approved clamps, brackets, or straps as applicable and held in place with properly selected screws. No wiring shall be imbedded inside any walls, floor, or ceiling. Entrance power, outside light, air conditioning outlet, and telco are the only wiring that may penetrate shelter walls or floor.

3. All wire raceway, conduit, etc. is to be mechanically joined and secured.

4. Flexible steel conduit or armored cable shall protect wiring connected to motors, fans, etc., and other short runs where rigid conduit is not practical.

5. Unless otherwise specified, all power wiring shall be a minimum №12 American wire gauge (AWG) size solid copper conductors with insulation rated for 600 volts AC (VAC).

M. Light Fixtures:

1. Ceiling-mounted 4-foot fluorescent light fixtures (two 40 watt bulbs per fixture) with RFI ballasts shall be supplied for the equipment shelters. A sufficient quantity of light fixtures shall be supplied to provide a uniform light level throughout the building of 150 foot candles at four feet above the floor.

2. Light fixtures shall be fed as a gang from a common breaker and controlled by an on/off switch near the door.

N. Outdoor Lighting:

1. An exterior 100 watt or LED equivalent wall-mounted, motion-controlled light shall be mounted on the front entrance of the shelter.

2. The exterior lighting system shall be fed from a separate, appropriately rated breaker and light switch by the door.

O. HVAC:

1. Respondents shall provide an HVAC system for each shelter proposed. Respondents shall propose dual air conditioning units with lead lag controller. Each air conditioning unit shall be sized for 100 percent of the building’s required cooling capacity, as determined by British thermal unit (BTU) analysis.

2. The selected Respondent shall perform BTU analysis (heat load calculations) for all shelter equipment during preliminary design to verify HVAC system size. All calculations shall include a 50 percent expansion factor, and all assumptions regarding power consumption, duty factor, and heat loading shall be thoroughly explained.

3. Each unit shall be capable of maintaining an inside ambient temperature range between 65 and 85 degrees (°) Fahrenheit (F). Each unit shall be sized to maintain temperatures inside the shelter at 70° F when exterior temperatures go as high as 100° F.

4. The HVAC system shall be controlled by a wall-mounted thermostat. The thermostat shall turn the heater on when the temperature inside the shelter drops to 65° F and off when it rises to 68° F. It shall turn on the air conditioner when the interior temperature reaches 78° F and off when the temperature drops below 75° F. Thermostat control shall be adjustable within the range of 45° to 85° F.

P. Antenna Cable Conduit Entry:

1. A bulkhead panel shall be supplied to accommodate coaxial transmission lines between ½-inch and $1^5/_8$-inch diameter elliptical waveguides.

2. A minimum of 12 transmission lines shall be accommodated with 4-inch openings.

3. The building manufacturer shall seal the conduits into the wall to assure that they are watertight.

Q. Cable Tray:

1. All new shelters shall be equipped with cable trays.

2. The selected Respondent shall install a minimum 24-inch wide cable tray system above the equipment racks.

R. Shelters shall be supplied with at least one 10-pound (lb) CO_2 fire extinguisher, an approved eye wash station, and first aid kit.

S. Shelters shall be equipped with a current production Clean Agent Fire Suppression System, appropriately sized for the shelter. Respondents shall identify and provide descriptive literature on the proposed system.

6.4. GENERATOR AND AUTOMATIC TRANSFER SWITCH

A. The selected Respondent shall provide an emergency generator system at each new radio communications site for backup power.

B. This section provides specifications and requirements for standby power systems to supply electrical power in the event of failure of normal supply, consisting of a liquid-cooled engine, an

AC alternator and system controls with all necessary accessories for a complete operating system, including, but not limited to, the items as specified.

C. Respondents shall perform electrical loading analysis for shelter equipment, including HVAC subsystems, during preliminary design to verify generator size and fuel tank capacity. All electrical loading calculations shall include a 50 percent expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.

    1. For the purpose of the proposal, Respondents shall assume the following:

        a) 100 kW

        b) Three phase

        c) 60 hertz (Hz)

        d) 0.8 Power factor

        e) Diesel fuel

        f) 500 gallon fuel tank)

        g) Minimum 72-hour runtime

D. In the event of a commercial power outage, the emergency generator shall provide power to the entire shelter without system outage.

E. The site should be equipped with an exterior connection and a manual transfer switch to support an alternate generator in the event of a failure to the primary generator. The connection should fit a standard Appleton plug. The associated plug and cable shall be provided by the Respondent.

F. The system shall be supplied by a manufacturer regularly engaged in the production of engine-alternator sets, automatic transfer switches (ATSs), and associated controls for a minimum of ten years, thereby identifying one source of supply and responsibility.

G. The generator system and all accessories and ancillary equipment shall comply with the following standards:

    1. NFPA 37 *Flammable and Combustible Liquids Code*

    2. NFPA 55 *Standard for the Storage and Handling of Compressed Gases*

3. NFPA 70 *National Electric Code*®, with particular attention to Article 700, “Emergency Systems”

4. NFPA 110 *Requirements for Level 1 Emergency Power Supply System*

5. NFPA 101 *Code for Safety to Life From Fire in Buildings and Structures*

6. ANSI/NEMA MG 1-2011 *Motor and Generators*

7. ANSI/NEMA AB 3-2013 *Molded-Case Circuit Breakers and Their Application*

8. ANSI/NEMA 250-2011 *Enclosures for Electrical Equipment (1000 Volts Maximum)*

H. All wiring harnesses and connectors shall be clearly identified by number and function according to the associated schematic diagrams and documentation provided by the vendor.

I. Factory Testing:

1. Before shipment of the equipment, the generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:

a) Verification that all safety shutdowns are functioning properly

b) Verification of single step load pick-up per NFPA 110-1996, Paragraph 5-13.2.6

c) Verification of transient and voltage dip responses and steady state voltage and speed (frequency) checks

d) Full load test for a minimum of one hour

2. The selected Respondent shall provide complete report(s) of all testing performed.

J. Startup and Checkout:

1. The supplier of the electric generating plant and associated items covered herein shall provide factory-trained technicians to check the completed installation and to perform an initial startup inspection to include:

a) Ensuring the engine starts (both hot and cold) within the specified time

b) Verifying engine parameters within specification

c) Verifying no load frequency and voltage, adjusting if required

d) Testing all automatic shutdowns of the generator

e) Performing a simulation of power failure to test generator startup and ATS to pick-up building load correctly

f) Returning to commercial power and testing generator and ATS to demonstrate correct cycling to normal commercial power

g) Performing a load test of the generator to ensure full load frequency and voltage is within specification by using building load; this test shall be run for a minimum of one hour

h) Testing and verifying all remote indicators and controls

2. The selected Respondent shall provide complete report(s) of all testing performed.

6.4.1. *Diesel Generator*

A. The prime mover shall be a liquid-cooled, diesel-fueled, naturally aspirated engine of 4-cycle design.

B. The engine shall have sufficient horse power rating to drive the generator to full output power without a gear box between the engine and generator.

C. The engine shall have a battery charging DC alternator with a solid state voltage regulator.

D. The engine shall have a unit-mounted, thermostatically-controlled water-jacket heater to aid in quick starting. The wattage shall be as recommended by the manufacturer. A proper electrical branch circuit feed from a normal 120 volt utility power source shall be provided.

E. The generator shall meet temperature rise standards for Class "H" insulation, operating within Class "F" standards for extended life.

F. The alternator shall be protected by internal thermal overload protection and an automatic reset field circuit breaker.

G. One-step load acceptance shall be 100 percent of generator set nameplate rating and meet the requirements of NFPA 110 paragraph 5-13.2.6.

H. The electric plant shall be mounted with vibration isolators on a welded steel base that shall permit suitable mounting to any level surface.

I. A main line output circuit breaker carrying the UL mark shall be factory installed.

1. Form C auxiliary contacts rated at 250 VAC/10 amperes shall be provided to allow remote sensing of breaker status.

2. A system utilizing manual reset field circuit breakers and current transformers is unacceptable.

J. An alternator strip heater shall be installed to prevent moisture condensation from forming on the alternator windings.

K. Controls:

1. All engine alternator controls and instrumentation shall be designed, built, wired, tested and shock-mounted in a NEMA 1 enclosure mounted to the generator set by the manufacturer. It shall contain panel lighting, a fused DC circuit to protect the controls and a +/- 5 percent voltage adjusting control.

2. The generator set shall contain a complete 2-wire automatic engine start-stop control that starts the engine on closing contacts and stops the engine on opening contacts.

3. A programmable cyclic cranking limiter shall be provided to open the starting circuit after four attempts if the engine has not started within that time. Engine control modules must be solid state plug-in type for high reliability and easy service.

4. The panel shall include:

a) Analog meters to monitor:

1) AC voltage

2) AC current

3) AC frequency

b) Phase selector switch

c) Emergency stop switch

d) Audible alarm

e) Battery charger fuse

f) Programmable engine control

g) Monitoring module

5. The programmable module shall include:

a) Manual OFF/AUTO switch

b) Four light emitting diodes (LEDs) to indicate:

1) Not In Auto

2) Alarm Active

3) Generator Running

4) Generator Ready

6. The module shall display all pertinent unit parameters including:

a) Generator Status – ON/OFF/AUTO

b) Instrumentation – Real-time readouts of engine and alternator analog values:

1) Oil pressure

2) Coolant temperature

3) Fuel level (where applicable)

4) DC battery voltage

5) Run time hours

c) Alarm Status – Current alarm(s) condition of:

1) High or low AC voltage

2) High or low battery voltage

3) High or low frequency

4) Low or pre-low oil pressure

5) Low water level

6) Low water temperature

7) High and pre-high engine temperature

8) High, low, and critical low fuel levels (where applicable)

9) Over crank

10) Over speed

11) Low Fuel

12) Unit not in "Automatic Mode"

L. Unit Accessories:

1. Weather protective enclosure:

   a) The generator set shall be factory-enclosed in a heavy gauge steel enclosure constructed with 12 gauge corner posts, uprights, and headers.

   b) The enclosure shall be coated with electrostatically applied powder paint, baked and finished to manufacturer’s specifications.

   c) The enclosure is to have large, hinged doors to allow access to the engine, alternator and control panel.

2. The exhaust silencer(s) shall be provided of the size recommended by the manufacturer and shall be of critical-grade.

3. The generator set shall include an automatic dual-rate battery charger manufactured by the generator set supplier. The battery charger is to be factory-installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.

4. A heavy-duty, lead-acid 12 VDC battery shall be provided by the generator set manufacturer. The generator set shall have a frame suitable for mounting the battery and include all connecting battery cables.

5. A 500-gallon integral fuel tank shall be installed beneath the generator.

6.4.2. *Automatic Transfer Switch*

A. The ATS shall be compatible with the set so as to maintain system compatibility and local service responsibility for the complete emergency power system.

B. Representative production samples of the transfer switch supplied shall have demonstrated through tests the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is defined as the electrically operated transfer from normal to emergency and back to normal.

C. Wiring must comply with NEC® table 373-6(b). The manufacturer shall furnish schematic and wiring diagrams for the particular ATS and a typical wiring diagram for the entire system.

D. Ratings and Performance:

1. The ATS shall be adequately sized to match the generator and shelter electrical systems.

2. The ATS shall be a 2-pole design rated for 600 VAC 400 amperes continuous operation in ambient temperatures of -20° F (-30° Celsius [C]) to +140° F (+60° C).

3. The operating mechanism will be a single operating coil design, electrically operated, and mechanically held in position.

4. A provision will be supplied to be able to manually operate the switch in the event of logic or electrical coil failure.

E. Controls:

1. A solid state under-voltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs.

a) Pick-up and drop-out settings shall be adjustable from a minimum of 70 percent to a maximum of 95 percent of nominal voltage.

b) A utility sensing interface shall be used, stepping down system voltage of 120/240 VAC 1 phase to 24 VAC, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.

2. Controls shall signal the generator set to start in the event of a power interruption.

a) A solid state time delay start, adjustable from 0.1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.

3. Controls shall transfer the load to the generator set after it reaches proper voltage:

    a) Adjustable from 70–90 percent of system voltage.

    b) Adjustable from 80–90 percent of system frequency.

    c) A solid state time delay, adjustable from five seconds to three minutes, shall delay this transfer to allow the generator to warm up before application of load.

    d) There shall be a switch to bypass this warm up timer when immediate transfer is required.

4. Controls shall retransfer the load to the line after normal power restoration.

    a) A return to utility timer, adjustable from 1–30 minutes, shall delay this transfer to avoid short-term normal power restoration.

5. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.

6. Controls shall signal the generator to stop after the load retransfers to normal.

    a) A solid state engine cool down timer, adjustable from 1–30 minutes, shall permit the engine to run unloaded to cool down before shutdown.

    b) If the utility power fails during this time, the switch will immediately transfer back to the generator.

7. The transfer switch shall have a time delay neutral feature to provide a time delay, adjustable from 0.1 to 10 seconds, during the transfer in either direction, during which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle.

8. A switch shall be provided to bypass all transition features when immediate transfer is required.

9. The transfer switch shall have an in-phase monitor that allows the switch to transfer between live sources if their voltage waveforms become synchronous within 20 electrical degrees within ten seconds of transfer initiation signal.

a) If the in-phase monitor will not allow such a transfer, the control must default to time delay neutral operation.

10. Front-mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays, FAST TEST mode which bypasses all time delays to allow for testing the entire system in less than one minute, or AUTOMATIC mode to set the system for normal operation.

    a) The controls shall provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATION (amber). These lights must be energized from utility or the generator set.

    b) The controls shall provide a manually operated handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure and accessible only by authorized personnel.

    c) The controls shall provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch will also be used for manual transfer switch operation.

    d) The controls shall provide LED status lights to give a visual readout of the operating sequence including:

        1) Utility on

        2) Engine warm-up

        3) Standby ready

        4) Transfer to standby

        5) In-phase monitor

        6) Time delay neutral

        7) Return to utility

        8) Engine cool down

        9) Engine minimum run

6.5. UNINTERRUPTIBLE POWER SUPPLY

A. Respondents shall provide a three-phase, online, double-conversion, static-type UPS at each shelter with the following features:

1. Surge suppression
2. Input harmonics reduction
3. Rectifier/charger
4. Inverter
5. Static bypass transfer switch
6. Battery and battery disconnect device
7. Internal maintenance bypass/isolation switch
8. Output isolation transformer
9. Remote UPS monitoring provisions
10. Battery monitoring
11. Remote monitoring

B. Respondents shall perform electrical loading analysis for shelter equipment, excluding HVAC subsystems, during preliminary design to verify UPS size required. All electrical loading calculations shall include a 50 percent expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.

C. For the purpose of the proposal, Respondents shall assume the following:

1. 50 kilovolt ampere (kVA) output
2. Three phase
3. 60 Hz
4. 0.8 Power Factor
5. Minimum two hour runtime

D. Quality Assurance:

1. Electrical components, devices, and accessories shall be listed and labeled as defined in NEC®, by a qualified testing agency, and marked for intended location and application.

2. UL compliance shall be listed and labeled under UL 1778 by a Nationally Recognized Testing Laboratory (NRTL).

3. NFPA compliance shall identify UPS components as suitable for installation in computer rooms according to NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*.

E. Operational Requirements:

1. Automatic operation includes:

a) Normal Conditions: Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output.

b) Abnormal Supply Conditions: If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to maintain constant, regulated inverter power output to the load without switching or disturbance.

c) If normal power fails, energy supplied by the battery through the inverter continues supply-regulated power to the load without switching or disturbance.

d) When power is restored at the normal supply terminals of the system, controls automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger then supplies power to the load through the inverter and simultaneously recharges the battery.

e) If the battery becomes discharged and normal supply is available, the rectifier-charger charges the battery. On reaching full charge, the rectifier-charger automatically shifts to float-charge mode.

f) If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch switches the load to the normal AC supply circuit without disturbance or interruption.

g) If a fault occurs in the system supplied by the UPS, and current flows in excess of the overload rating of the UPS system, the static bypass transfer switch operates to bypass the fault current to the normal AC supply circuit for fault clearing.

h) When the fault has cleared, the static bypass transfer switch returns the load to the UPS system.

i) If the battery is disconnected, the UPS continues to supply power to the load with no degradation of its regulation of voltage and frequency of the output bus.

2. Manual operation includes:

a) Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal AC supply circuit without disturbance or interruption.

b) Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter.

3. Basic system controls shall be accessible on a common control panel on the front of the UPS enclosure.

F. Performance Requirements:

1. Input:

a) Single phase, 3-wire

b) Voltage: 120/240V Nominal

c) Frequency: 50/60 Hz +/- 3 Hz

2. Output:

a) Capacity: to be determined by selected Respondent during preliminary design

b) Voltage: 120/240V

c) Frequency: 60 Hz, +/- 3 Hz

d) Maximum Voltage Distortion: 5 percent at full load

3. Minimum Duration of Supply: If the battery is the sole energy source supplying rated full UPS load current at 80 percent power factor, duration of the supply is 30 minutes.

4. Minimum Overload Capacity of UPS at Rated Voltage: 125 percent of rated full load for 10 minutes and 150 percent for 30 seconds in all operating modes.

5. EMI Emissions: Comply with FCC Rules and Regulations and with 47 Code of Federal Regulations (CFR) 15 for Class A equipment.

6. Electronic Equipment: Solid-state devices using hermetically-sealed, semiconductor elements. Devices include rectifier-charger, inverter, and system controls.

7. Surge Suppression: Protect internal UPS components from surges that enter at each AC power input connection and protect rectifier-charger, inverter, controls, and output components.

    a) Use factory-installed surge suppressors tested according to IEEE C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits, and IEEE C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.

    b) Additional Surge Protection: Protect internal UPS components from low-frequency, high-energy voltage surges described in IEEE C62.41.1 and IEEE C62.41.2. Circuits connecting with external power sources and select circuit elements, conductors, conventional surge suppressors, and rectifier components and controls shall be designed so input assemblies will have adequate mechanical strength and thermal and current-carrying capacity to withstand stresses imposed by 40 Hz, 180 percent voltage surges described in IEEE C62.41.1 and IEEE C62.41.2.

8. Rectifier-Charger:

    a) Capacity: Adequate to supply the inverter during rated full output load conditions and simultaneously recharge the battery from fully discharged condition to 95 percent of full charge within ten times the rated discharge time for the duration of the supply under battery power at full load.

    b) Output Ripple: Limited by output filtration to less than 0.5 percent of rated current, peak-to-peak.

    c) Battery Float-Charging Conditions: Comply with battery manufacturer's written instructions for battery terminal voltage and charging current required for maximum battery life.

9. Inverter: Pulse-width modulated, with sinusoidal output.

G. Tests and Inspections:

1. Comply with manufacturer's written instructions.

2. Inspect interiors of enclosures, including:

a) Integrity of mechanical and electrical connections

b) Component type and labeling verification

c) Ratings of installed components

3. Test manual and automatic operational features and system protective and alarm functions.

4. Load the system using a variable-load bank to simulate kVA, kW, and power factor of loads for the unit's rating.

a) Simulate malfunctions to verify protective device operation.

b) Test duration of supply on emergency, low-battery voltage shutdown, and transfers and restoration due to normal source failure.

c) Test harmonic content of input and output current less than 25, 50, and 100 percent of rated loads.

d) Test output voltage under specified transient-load conditions.

e) Test efficiency at 50, 75, and 100 percent of rated loads.

5. Provide inspection reports.

H. Demonstration: Train County’s maintenance personnel to adjust, operate, and maintain the UPS.

6.6. SITE PREPARATION

A. Respondents shall perform all site preparation for site improvements as necessary. Work includes, but is not limited to:

1. Protecting existing plants and grass to remain
2. Removing existing plants and grass as necessary
3. Clearing and grubbing
4. Stripping and stockpiling topsoil
5. Removing above- and below-grade site improvements
6. Disconnecting, capping or sealing, and removing site utilities
7. Temporary erosion and sedimentation control measures
8. Access road development

B. The following Construction Specifications Institute (CSI) standard sections are referenced but not included in this RFP:

1. Division 1 Section, Temporary Facilities and Controls, for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures
2. Division 1 Section, Execution Requirements, for verifying utility locations and for recording field measurements
3. Division 1 Section, Selective Demolition, for partial demolition of buildings or structures undergoing alterations
4. Division 2 Section, Building Demolition, for demolition of buildings, structures, and site improvements
5. Division 2 Section, Tree Protection and Trimming, for protecting trees remaining on-site that are affected by site operations
6. Division 2 Section, Earthwork, for soil materials, excavating, backfilling, and site grading
7. Division 2 Section, Lawns and Grasses, for finish grading including preparing and placing planting soil mixes and testing of topsoil material

C. The selected Respondent shall comply with Department of Environmental Resources and Bureau of Water and Soil Conservation guidelines for Erosion and Sedimentation (E&S) Control.

D. Respondents shall carefully examine and study existing conditions, difficulties, and utilities affecting execution of work. Later claims for additional compensation due to additional labor, equipment, or materials required due to difficulties encountered or underground water conditions will not be considered.

E. The selected Respondent shall verify that existing plant life to remain and clearing limits are clearly tagged, identified, and marked in such a manner as to ensure their safety throughout construction operations.

F. Protection:

1. The selected Respondent shall protect and maintain benchmark, monument, property corner, and other reference points, re-establishing them by Registered Professional Surveyor if disturbed or destroyed, at no cost to the City.

2. The selected Respondent shall locate and identify existing utilities that are to remain and protect them from damage, re-establishing them if disturbed or destroyed, at no cost to the City.

3. The selected Respondent shall protect trees, plant growth, and features to remain as final landscape. Branches or roots of any trees that are to remain shall not be disturbed. Adequate guards, fences, lighting, warning signs, and similar items shall be provided and maintained as required.

4. The selected Respondent shall install protection such as fencing, boxing of tree trunks, or other measures as approved by the project engineer.

5. The selected Respondent shall conduct operations with minimum interference to public or private accesses and facilities, maintain ingress and egress at all times, and clean or sweep any roadways daily or as required. At such times as deemed necessary by the City, dust control shall be provided with water sprinkling systems or equipment provided by the selected Respondent.

6. When appropriate, the selected Respondent shall provide traffic control as required, in accordance with the contract documents, the U.S. Department of Transportation "Manual of Uniform Traffic Control Devices," and Tennessee Department of Transportation requirements.

G. Clearing:

1. The selected Respondent shall clear areas required for access to the site and execution of work.

2. Unless otherwise indicated, the selected Respondent shall remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with the installation of new construction. Removal includes digging out stumps, roots, and root material. Depressions caused by clearing and grubbing operations are to be filled to sub-grade elevation to avoid water pooling. Satisfactory fill material shall be placed in horizontal layers not exceeding eight inches loose depth, and thoroughly compacted per fill requirements of this section and CSI Division 2-Site Construction-Section 02200.

3. The selected Respondent shall remove grass, trees, plant life, stumps, and all other construction debris from the site to a location that is suitable for handling such material according to state laws and regulations.

H. Demolition:

1. The selected Respondent shall remove existing pavement, utilities, curbing, and shrubbery as necessary for construction or improvements.

I. Topsoil Excavation:

1. The selected Respondent shall strip topsoil from areas that are to be filled, excavated, landscaped, or re-graded to such a depth that it prevents intermingling with underlying subsoil or questionable material.

2. The selected Respondent shall stockpile topsoil in storage piles in areas not scheduled for construction, job trailer location, or equipment lay-down areas, or where directed by the project engineer. Storage piles shall be constructed to freely drain surface water. Storage piles shall be covered as required to prevent windblown dust. Unsuitable soil shall be disposed of as specified for waste material, unless otherwise desired by the City. Excess topsoil shall be removed from the site by the selected Respondent.

3. Final topsoil coatings shall consist of organic soil found in depth of not less than six inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over two inches in diameter, weeds, roots, and other objectionable material.

J. Access Roads:

1. A 12-foot wide access road shall be provided to the fence gate at new sites.

2. Road beds shall be prepared, rolled, and provided with six inches of aggregate base course.

3. Roads shall be graded appropriately for proper drainage and minimal erosion.

6.7. FENCING

A. Respondents shall provide chain-link fencing around the perimeter of all new proposed sites.

B. Framework: Type I or Type II Steel Pipe.

1. Type I: Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to Standard Specification ASTM F-1083; or,

2. Type II: Pipe manufactured from steel conforming to ASTM A569. External surface triple coated per ASTM F-1234. Type II pipe shall demonstrate the ability to resist 1,000 hours of exposure to salt spray with a maximum of 5 percent red rust in a test conducted in accordance with ASTM B-117.

3. All coatings are to be applied inside and out after welding.

4. Unless otherwise noted, Type II framework shall be provided.

5. Pipe shall be straight, true to section and conform to the following weights:

Table 3 – Type I and Type II Steel Pipe Specifications

Pipe Size Outside Diameter (O.D.)	Type I Weight Lb./Ft.	Type II Weight Lbs./ Ft.
1 5/8"	2.27	1.84
2"	2.72	2.28
2 ½"	3.65	3.12
3"	5.79	4.64
3 ½"	7.58	5.71
4"	9.11	6.56
6.58"	18.97	N/A

C. Fabric:

1. Aluminized fabric shall be manufactured in accordance with ASTM A-491 and coated before weaving with a minimum of 0.4 ounces of aluminum per square foot of surface area. The steel wire and coating shall conform to ASTM A-817. Fabric shall be 9-gauge woven in a 2-inch diamond mesh. The top selvage shall be twisted and barbed. The bottom selvage shall be knuckled.

2. Zinc-coated fabric shall be galvanized after weaving with a minimum 1.2 ounces of zinc per square foot of surface area and conform to ASTM A-392, Class I. Fabric shall be 9-gauge wire woven in a 2-inch diamond mesh. The top selvage shall be twisted and barbed. The bottom selvage shall be knuckled.

D. Fence Posts:

Table 4 – Fence Post Specifications

Fence Posts TYPE I - II		
Fabric Height	**Line Post O.D.**	**Terminal Post O.D.**
Under 6’	2”	2 ½”
6’ – 9’	2 ½”	3”
9’ – 12’	3”	4”

E. Gate Posts:

Table 5 – Gate Posts Specifications

Gate Posts Type II		
Single Gate Width	**Double Gate Width**	**Post O.D. Type II**
Up to 6’	Up to 12’	3”
7’ – 12’	13’ – 25’	4”

F. Rails and Braces: 1 $^{5}/_{8}$-inch O.D.

G. Gates: Frame assembly of 2-inch O.D. pipe Type I or Type II with welded joints. Weld areas shall be repaired with zinc-rich coating applied per manufacturer's directions. The fence fabric shall match the fence posts, gate posts and gates. Gate accessories, hinges, latches, center stops, keepers and necessary hardware shall be of a quality required for industrial and commercial application. Latches shall permit padlocking. The selected Respondent shall provide one combination padlock for each gate. All padlocks shall have the same combination.

H. Installation:

1. General: Fence installation shall conform to ASTM F-567, *Standard Practice for Installation of Chain-Link Fence*.

2. Height: Fence height shall be as indicated on contract drawings. If no height is indicated, the fence shall be seven feet high, plus one foot for barbed wire.

3. Post Spacing: Line posts shall be uniformly spaced between angle points at intervals not exceeding ten feet.

4. Bracing: Gate and terminal posts shall be braced back to adjacent line posts with horizontal brace rails and diagonal truss rods.

5. Top Rail: The top rail shall be installed through the line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts.

6. Fencing shall have a bottom rail instead of a tension wire.

7. Fabric: The fabric shall be pulled taut with the bottom selvage two inches above grade. The fabric shall be fastened to the terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15-inch intervals. The fabric shall be tied to the line posts and top rails with tie wires spaced at a maximum of 12 inches on posts and 24 inches on rails. The fabric shall be attached to the bottom rail with top rings at maximum 24-inch intervals.

8. Barbed Wire: Barbed wire shall be anchored to the terminal extension arms, pulled taut and firmly installed in the slots of the line post extension arms.

9. Valleys: Should the fence cross a ditch or drainage swell, $^{3}/_{8}$-inch diameter aluminum alloy rods shall be driven vertically 18 inches into the ground on 4-inch centers, woven through the fence fabric to provide security for these areas.

10. Vegetation stop and aggregate shall be applied to the entire compound area (the area inside the fencing) and six inches beyond the fencing. Vegetation stop shall be constructed with weed barrier geotextile and aggregate shall be applied three inches in depth and consist of American Association of State Highway and Transportation Officials (AASHTO) #10 coarse aggregate.

7. TOWER ANALYSIS AND REMEDIATION

7.1. TOWERS

A. Memphis and Shelby County currently utilize ten towers for the current SmartZone system. Six towers are owned and maintained by Memphis and four towers are owned and maintained by Shelby County.

B. The City of Memphis' towers were manufactured and sold by Andrew Corporation and were installed circa 1994. Tower locations are as follows:

1. Fire Station 7 1017 Jefferson Avenue, Memphis
2. Fire Station 31 4258 Overton Crossing Street, Memphis
3. Fire Station 45 5185 Highway 61, Memphis
4. Fire Station 51 5921 Shelby Oaks Drive, Memphis
5. Fire Station 52 6675 Winchester Road, Memphis
6. Armour Center 79 Flicker Street, Memphis

C. The tower at Fire Station 51 was evaluated as part of this project's due diligence, at TIA-222-G Class III, and was found to be stressed at 131 percent for Class III usage and 95 percent for Class II usage with current loading.

D. Three of Shelby County's four towers were supplied by WesTower Communications through Motorola in 2004. Tower locations are as follows:

1. Locke 7709 Benjestown Road, Millington
2. Redwood 9892 Redwood Road, Millington
3. Fisherville 2012 N. Arlington-Fisherville Road, Fisherville

Shelby County's fourth tower is located at the Shelby Farms county complex. This tower is an 800-foot Pi-Rod guyed tower manufactured circa 1988, under TIA-222-C.

4. Shelby Farms Sycamore View Road, Memphis

7.2. TOWER ANALYSIS

A. The selected Respondent shall perform a structural analysis on each tower. The analysis shall be performed and sealed by a registered PE, experienced and qualified in performing communications tower analyses.

B. The analysis shall be based upon the selected Respondent's final system antenna requirements and the transitional load that shall be placed upon the tower during the planned migration between the SmartZone and P25 systems.

C. The analysis shall be performed for each tower under the current revision of TIA-222 for Class III (Public Safety) usage and the topographic and exposure categories applicable to the location of each tower.

D. Construction drawings provided by the original tower vendors are available for review.

7.3. TOWER REMEDIATION

A. Based upon the outcome of the tower analyses, the selected Respondent shall provide a firm proposal to the City for tower remediation to bring each tower up to the prevailing TIA-222 standard.

B. Remediation is desired to accommodate both the transitional load and the final new system load plus 25 percent additional capacity for growth.

C. The actual remediation procurement shall be under a separate purchase or change order.

7.4. TOWER LIGHTING

A. Respondents shall propose replacement of all tower lighting systems utilizing Light Emitting Diode (LED) technology, compliant with the requirements of FAA Advisory Circular Number 70/7460-1L.

8. TRAINING

A. The selected Respondent shall develop and conduct training programs to allow personnel to become knowledgeable with the system, subsystems, and individual equipment.

1. The selected Respondent shall provide complete and comprehensive technical training for technical staff charged with maintaining and managing the system. This training shall include, but is not limited to: system theory of operation; planning and setting up the system and network; building and implementing system and network profiles and configurations; performing database management functions; monitoring and managing the system's performance; system monitoring techniques; system repair and troubleshooting techniques; and writing and printing system reports.

2. System management and maintenance training shall include the following categories:

a) NMS operation and control

b) Radio system theory of operation, programming, set-up, and maintenance to the repairable/replaceable component level

c) System configuration and fleet mapping

d) Radio network theory of operation, IP structure and theory, system and sub-system element programming, and maintenance

e) Microwave network management

f) Microwave network theory of operation and maintenance to the repairable/replaceable component level.

g) System mobile and portable radio configuration, personality development, programming, maintenance, and installation

h) Radio programming software training for all system elements and user radios

3. The selected Respondent shall provide complete and comprehensive operational training for all user agency dispatchers on the provided dispatch console systems. This training shall include, but not be limited to:

a) Set up and use of all functional elements and features included in the consoles

b) All graphic user interface elements, manipulation, function, and use

c) Patching and multiple talkgroup operation

d) Use of headsets, microphones, speakers, and mouse controls

4. The selected Respondent shall provide operator training to end user personnel on the proper operation and care of assigned mobile and portable radio equipment. This training shall include, but not be limited to:

a) Proper microphone technique

b) Button, knob, and keypad functionality as programmed for that agency

c) Proper battery maintenance

d) Screen icon interpretation and meaning

B. Respondents shall fully describe all proposed training programs, detailing how the Respondent intends to provide training. The training description shall include:

1. A list of all subjects with a description of each

2. Class material to be provided by the Respondent

3. Number of classes

4. Class duration

5. Need for recurring training

6. Class size

7. Class cost

C. All operator training shall be conducted at “to be determined” locations within Shelby County. Technical and system management training shall be provided on the Memphis/Shelby County system where practical. Technical training requiring lab and live system training may be scheduled at the selected Respondent’s training facility. The selected Respondent shall coordinate with the City regarding number of attendees and schedule.

D. Classes shall be scheduled as near to system cutover as possible.

E. The selected Respondent shall train Memphis and Shelby County employees or designated individuals. In some cases, a Train-the-trainer approach will be used to train other users.

F. The selected Respondent shall provide all instructional material, including printed manuals, audio, video, interactive self-paced personal computer programs, and complete equipment operating instructions for all technical and operational training classes.

1. Actual and/or exact model and series of equipment being delivered shall be made available for hands-on use and operation during training.

2. All instructional material shall be subject to the approval of the City/County and shall become property of the City/County.

3. Additional training courseware and related media to be used in future academy training and refresher training shall be provided in a reproducible format with no limitation on the number of copies to be reproduced for training use.

9. WARRANTY, MAINTENANCE, AND SUPPORT

9.1. WARRANTY

A. The proposed communications system shall have a warranty period of one year. The one-year warranty period shall commence upon Final Acceptance.

B. The selected Respondent shall provide a single toll-free telephone number that answers 24 hours a day, 7 days a week, 365 days a year for service requests and warranty claims.

C. Respondents shall state in their proposal the name, address, and capabilities of the service station(s) providing warranty service.

D. The procedures below shall be followed during the warranty period.

    1. Warranty maintenance shall be performed 24 hours a day with no additional charges for work on critical infrastructure outside of normal 8:00 a.m. to 5:00 p.m. business hours.

    2. The service facility shall provide prompt repair service, with service personnel arriving on-site within two hours after a service request by the City and returning the system to service within four hours after a service request.

    3. On-call City technical personnel shall be notified of the dispatch with the opportunity to accompany the warranty provider.

    4. The City shall be provided with written documentation indicating the cause of the service outage, the resolution, and all post-repair testing procedures to ensure proper operation. In the event City-owned spares are used to complete repair, the model and serial number of both the defective unit and the spare shall be noted in the documentation.

    5. For all equipment needing factory or depot repairs, a comprehensive tracking system shall be put in place by the selected Respondent to track units to and from the factory/depot.

9.2. EXTENDED WARRANTY

A. As an option, Respondents shall propose an extended warranty for years two to five, renewable on an annual basis.

B. Respondents shall fully describe the terms and conditions of the extended warranty in their proposal.

9.3. MAINTENANCE

A. The City system is a customer owned and maintained system. The city has a qualified staff of technical personnel who maintain the system infrastructure and user radios. The City intends to train and utilize this staff to maintain the new systems.

B. The selected Respondent shall maintain and repair all systems, equipment, hardware, and software throughout the implementation/migration and warranty periods. The City reserves the right to have technical staff on-site to witness and, if desired, assist in the maintenance and troubleshooting procedures. This does not relieve the selected Respondent from warranty and maintenance responsibility as defined in this RFP.

C. Respondents shall include a financial plan to reimburse the City for warranty work performed by city technical staff in lieu of having manufacturers' personnel performing warranty maintenance.

9.3.1. *General Requirements*

A. The approach to maintenance of this system shall be one of preventive maintenance.

B. Comprehensive maintenance services shall be proposed for each system.

C. Respondents shall provide a list of maintenance plans available. Plans should be based on the quantities of equipment included in the proposed system. Plans should have options for one, two, or three years. These plans shall include:

1. Fixed equipment on-site service:

    a) 2-hour response time

    b) 4-hour response time

    c) 8-hour response time

    d) Next day response time

    e) Full time on-site technician

2. Fixed equipment mail-in board repair:

    a) Normal response – Seven days

    b) Emergency response – Next day

3. All fixed equipment maintenance plans shall provide 24-hour system support such that users can dial one toll-free number to report problems and/or receive technical support.

4. Additionally for fixed on-site maintenance, the selected Respondent's staff will then dispatch the proper technician in the prescribed response time to resolve the problem, if

the selected Respondent is unable to resolve the problem through telephone consultation.

9.3.2. *Maintenance Standards*

A. Replacement parts used in repairs shall be equal in quality and ratings to the original parts.

B. Equipment shall be maintained in a clean condition. Oil, dust, and other foreign substances shall be removed on a routine basis.

C. Equipment and system performance shall be maintained at the level initially described in these equipment and systems specifications. The service organization shall maintain records to confirm this has been done at intervals defined by the City.

D. The selected Respondent shall provide only factory-trained and authorized maintenance personnel.

E. If fixed equipment or a fixed equipment module fails more than twice during the acceptance test or twice during the first year, the selected Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that the equipment is potentially prone to continuing failures, the selected Respondent shall replace it at no cost to the City.

9.4. PARTS AVAILABILITY

A. From the date of final acceptance to the seventh anniversary of the date of final acceptance, the selected Respondent shall maintain replacement parts for all delivered equipment.

B. In the event the selected Respondent plans to discontinue stocking any part required for maintenance after the seventh anniversary of acceptance, the selected Respondent shall send written notice to the City 24 months prior to the date of discontinuance to allow for last-time buys and replenishment.

C. All parts ordered on a priority basis shall be delivered within 24 hours after placing an order. The selected Respondent shall provide year-round, 24-hour ordering facilities via telephone, internet, e-mail, and fax service.

9.5. SPARE EQUIPMENT

A. Respondents shall propose recommended spare parts for the system, subsystems, and individual equipment.

B. The list of spare parts shall include, but is not limited to:

1. Any vendor-identified Field Replaceable Units (FRUs)

2. Any infrastructure component that does not have FRUs that can cause a critical failure if it were to fail (e.g., base station antennas, other non-modular components)

3. Power supplies

C. Spares for less critical items shall also be enumerated.

D. The list shall include items that will rapidly and completely restore all critical system functionality with the least amount of effort, e.g., board replacement instead of troubleshooting to the component level when a critical unit has failed.

E. The quantities of spares in the list shall be appropriately sized to accommodate equipment quantities in the system.

F. The list shall define the primary equipment category each spare kit supports, e.g., transceiver board for a repeater, interface board for a console, etc.

G. The system engineering design documentation shall include a narrative on the Respondent's ability to replace failed units from stock and the process and timing to repair, replace, and return failed units delivered for repair.

H. System engineering design documentation shall also include the life cycle of equipment, parts, and other maintenance support for the system.

9.6. FIFTEEN-YEAR COST OF OWNERSHIP

A. Respondents shall provide a complete fifteen-year cost of ownership for the proposed systems. The cost of ownership should be inclusive of all hardware maintenance, software maintenance, and system updates and upgrades necessary for the City to remain at the most current system release levels.

B. The provided cost of ownership should be such that no unanticipated costs should be expected within the fifteen-year period resulting from equipment failures, equipment end-of-life, software updates, additional maintenance costs, or other foreseeable expenditures.

10. SYSTEM IMPLEMENTATION, TESTING, AND ACCEPTANCE

10.1. GENERAL

A. The selected Respondent shall attend biweekly project meetings as deemed necessary by the City prior to and during installation. Additional meetings may be scheduled at the discretion of the City.

B. If any changes in the overall timeline occur, the selected Respondent shall update the project schedule for discussion during these project meetings.

C. The selected Respondent shall provide written minutes of all meetings no later than five business days after the meeting.

10.2. CUTOVER PLAN

A. The selected Respondent shall be responsible for planning and coordinating the implementation of all equipment, subsystems, and the overall system.

B. Execution of the cutover plan shall ensure that new systems are brought online with minimum interruption to all existing systems and communications.

C. During final design, the selected Respondent shall deliver a preliminary cutover plan describing how the proposed radio and microwave systems shall be phased over into a fully operational P25 system while maintaining ongoing dispatch and operation of the existing SmartZone 4.1 system.

1. The selected Respondent shall successfully complete all tests and training prior to the actual cutover of systems.

2. The selected Respondent shall provide the necessary labor to cutover from existing systems to the proposed system.

3. The plan shall include the schedule and procedures associated with the transition of each operational user group. The plan shall specifically address how the existing users will begin using the new system with minimal operational impact.

4. The plan shall provide detailed component or subsystem cutover plans, and specifically delineate between systems that affect and do not affect ongoing operations.

5. The City reserves the right to approve and change the cutover plan as it relates to any or all system components.

10.3. STAGING

A. Each individual assembly or equipment unit shall undergo factory testing prior to shipment.

B. Standard factory test documentation, documenting the tests performed and indicating successful completion of testing, shall be submitted to the City.

C. System Staging:

1. The complete system shall be staged and tested at the vendor's factory, in the United States, to the greatest extent practical. The intent of the staging tests is to demonstrate to the City that the system is ready for shipment and installation. The selected Respondent shall provide travel expense coverage for two City personnel, two County personnel, and two engineers/consultants to participate in the FATP.

2. The selected Respondent shall provide all necessary technical personnel and test equipment to conduct staging tests. All deviations, anomalies, and test failures shall be resolved at the selected Respondent's expense.

3. The selected Respondent shall use an approved FATP. It is expected that the FATP has been performed and all tests have been successful before the City/County witnesses the official FATP. The FATP shall be signed and dated by the selected Respondent, City representatives, and engineers/consultants following completion of all tests. All tests in the FATP shall be marked as either pass, fail, or pass qualify.

4. Failed tests shall be documented, corrected, and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the expense of the selected Respondent.

5. Retest of individual failed FATP tests or the entire plan shall be at the City's discretion.

6. The fully executed and completed FATP document shall be provided to the City.

7. Major sub-systems, such as microwave, may be tested at a different facility at a different time from the radio system. All the above items shall apply if the subsystems are staged at different locations and times.

10.4. SYSTEM INSTALLATION

A. Installation shall include a complete, tested system to include placement of associated cabling, appropriate system layout, and terminal connections. The selected Respondent shall provide associated power supplies and any other hardware, adapters, and/or connections to deliver a complete operable system to the City at the time of acceptance.

B. Qualified, adequately trained personnel familiar with this type of work shall perform all installations. All installations shall be performed by factory-authorized or selected Respondent-affiliated service shops. Other shops or installers may be used upon mutual agreement between

the City and the selected Respondent. Respondents shall provide the names of the service shops, a summary of their experience, and a list of five references (minimum) for each proposed shop.

C. Prior to the start of the system installation, the selected Respondent shall participate in a mandatory project site survey with the City to confirm actual equipment location within each space. At that time, the exact equipment locations shall be determined and documented by the selected Respondent.

D. The selected Respondent shall coordinate with others, as appropriate, to confirm that any prep work that affects the installation of the base station equipment, such as tower work, coring, bracing, conduit, electrical, etc., is complete before final inspection.

E. The selected Respondent shall provide and pay for all materials necessary for the execution and completion of all work. Unless otherwise specified, all materials incorporated into the permanent work shall be new and shall meet the requirements of this RFP. All materials furnished and work completed shall be subject to inspection by the City and County or the City and County's Engineer.

F. Equipment supplied as spare equipment shall not be used for installation of the proposed system. All spare equipment shall be supplied in an unused condition.

G. All equipment and devices shall be cleaned internally and externally, and all damaged finishes shall be repaired.

H. Worksites shall be left neat and broom swept upon completion of work each day. All shelter floors shall be thoroughly cleaned and all scuff marks and abrasions shall be removed prior to acceptance. All trash shall be removed weekly.

I. Inspection:

1. The City shall conduct an inspection of the installations upon substantial completion. Any deficiencies shall be documented on a single punch list and provided to the selected Respondent for resolution.

2. Final acceptance testing shall not commence until all punch list items are resolved.

10.5. COVERAGE TESTING

A. Respondents shall submit a preliminary CATP with the proposal. The final CATP shall be submitted during the final design stage of the project.

B. CATP:

1. The CATP shall be consistent with the procedures and guidelines outlined in TIA-TSB-88, latest revision.

2. Coverage testing shall commence only after the radio system is fully tested and aligned. Significant changes to the system shall require retesting of coverage at the City's discretion.

3. The selected Respondent shall perform two types of coverage testing:

    a) Automated Objective Mobile Drive testing

    b) Non-automated Subjective DAQ testing (intelligibility testing)

4. Automated and intelligibility testing shall be complementary and serve to fully verify that coverage requirements are met both technically and operationally.

5. Test Configurations:

    a) Testing configurations for automated and intelligibility testing shall represent typical operating configurations to the greatest extent possible, using portable and mobile radio equipment to be used with the system.

    b) Automated Objective Mobile Drive testing:

        1) The selected Respondent shall test both the signal level and BER, as applicable, at a statistically significant number of test locations throughout the county utilizing automated test equipment. The selected Respondent shall provide a description and, upon request, a demonstration of the test equipment prior to testing.

        2) For testing purposes, the county shall be divided into ¼-square mile bins (½-mile by ½-mile). The selected Respondent may subdivide grids if necessary to achieve statistical significance.

        3) Inaccessible grids shall not count as either a pass or fail in the statistical analysis. There should be a sufficient number of test grids to maintain statistical significance once inaccessible grids are excluded.

    c) Non-automated Subjective DAQ testing:

1) Non-automated subjective DAQ coverage testing shall be conducted using typical portable radios with the antennas, batteries, and audio accessories to be used with the system.

2) Talk-out and talk-back performance shall be documented.

3) The selected Respondent shall provide a standardized test form for testing.

d) The selected Respondent shall coordinate with the City to establish pass/fail criteria as well as correlation between the subjective and objective test results.

10.6. FULL LOAD 30-DAY OPERATIONAL TEST

A. The selected Respondent shall perform a 30-calendar day operational test of the system to ensure that all hardware and software defects have been corrected prior to entering final proof of performance testing.

1. This test will be conducted upon migration of all user agencies onto the system and will demonstrate the ability of the system to accommodate the usage load for a 30-day period.

2. The full integrated operation of the system, including all individual subsystems, shall be demonstrated during these tests.

3. The tests shall be designed to demonstrate the reliability, long-term stability, and maintainability of the systems.

4. A failure of any critical component of the system during this test shall cause the test to restart after the repair is completed.

5. The selected Respondent and the City shall agree on what constitutes a critical component failure prior to commencing this test.

B. The selected Respondent shall provide a 30-day operational test plan during the preliminary design phase.

10.7. FINAL ACCEPTANCE TESTING

A. Prior to final acceptance testing, the selected Respondent shall verify and document that all equipment, hardware, and software are upgraded to the latest factory revision. Multiple revision levels among similar equipment are not acceptable. The City shall be given two weeks written notice that the system is ready for final acceptance testing.

B. System Acceptance Testing (SAT)

1. The selected Respondent shall use the completed and approved FATP conducted at staging to test the operational features of the system.

2. In addition, the selected Respondent shall add all elements of the system, such as antenna system testing, microwave path testing, and network testing that could not be tested in a factory setting.

3. It is expected that the SAT has been performed and all tests have been successful before the City witnesses the official SAT.

4. The SAT plan shall be signed and dated by the selected Respondent and the City following completion of all tests. All tests in SAT shall be marked as either pass, fail, or pass qualify.

5. The selected Respondent shall provide all necessary technical personnel and test equipment to conduct SAT. All deviations, anomalies, and test failures shall be resolved at the selected Respondent's expense.

6. Failed tests shall be documented, corrected, and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the expense of the selected Respondent.

7. Retest of individual failed tests or the entire plan shall be at the City’s discretion.

8. The fully executed and completed SAT document shall be provided to the City upon completion.

10.8. AS-BUILT DOCUMENTATION

A. At the completion of the installation phase, the selected Respondent shall provide complete as-built documentation as outlined below.

1. Equipment provided

2. Plan and elevation drawings of all equipment, including antennas on towers

3. Cabling and terminations
4. Block and level diagrams
5. Setup and alignment information
6. Antenna system sweep data
7. Successfully completed, signed and dated FATP and SAT

B. All as-built documentation shall be delivered on USB flash drive or DVD as well as in loose-leaf binders for each site and communications center for the equipment at that location, with a comprehensive set of all as-built documentation for the City and County radio shops.

10.9. SYSTEM ACCEPTANCE

A. The City shall deem the system ready for final acceptance following successful completion and approval of the following:

1. Final design submittals
2. FATP
3. System installation
4. Final inspection and punch list resolution
5. SAT, including CATP
6. Training
7. 30-day operational test completion
8. As-built documentation

11. SUBSCRIBER EQUIPMENT

11.1. OVERVIEW

A. Subscriber equipment includes all 700/800 MHz band non-fixed user equipment, such as:

1. Portable radios
2. Mobile radios
3. Control stations

B. Respondents shall provide unit pricing for all user subscriber equipment and accessories.

11.2. GENERAL REQUIREMENTS

A. All subscriber equipment shall be of high quality and intended to provide high reliability under heavy use in severe environments. Equipment shall be an FCC-type accepted in accordance with FCC Part 90 Rules and Regulations.

B. All subscriber equipment shall meet MIL-STD-810 C, D, E, F and G.

C. All subscriber equipment shall be software programmable.

D. All mobiles, portables, and control stations shall support the following operating modes:

1. Conventional analog frequency modulation
2. Conventional P25 Phase 1 on-network (Repeat)
3. Conventional P25 Phase 1 off-network simplex
4. Trunked P25 Phase 1 on-network
5. Trunked P25 Phase 2 on-network

11.3. SOFTWARE LICENSING

Project 25 mobile and portable radios have evolved as software defined and managed radios. All user equipment is firmware and software based, using software driven applications to provide user radio operating features and capabilities.

11.3.1. *License Term*

Respondents shall propose software and firmware licensing costs for all user equipment. The term of licenses shall be for the time the proposed equipment is in use by the City, with no renewal or additional licensing fees.

11.3.2. *License Transferability*

In the event of the failure, loss, catastrophic damage or other event which renders any software/firmware driven system component useless and requires replacement of that component or user radio, the software and firmware licenses shall transfer to the replacement component or radio at no cost to the city. This shall also apply to any software based or software driven features and options in user mobile and portable radios which must be replaced due to being deemed “unrepairable”, lost, stolen, or replaced for any reason. The City will pay for the replacement equipment hardware, but all software features will transfer to the replacement equipment at no charge.

11.4. RADIOS

11.4.1. *Portable Radios*

A. Respondents shall provide pricing for portable radios. Memphis will procure approximately 4,750 portable radios and may procure less or more at its discretion. Shelby County will procure approximately 1,850 portable radios and may procure less or more at its discretion

B. All portables shall be included under Model 2 (limited keypad) for the purposes of the proposal; however, unit pricing shall be included for the other models available in a vendor’s product line.

C. Respondents shall provide an alternate tier product available, highly reliable, and intended for mission critical operations. Pricing shall be provided for a minimum of three models:

    1. Model 1: Basic model, typically identified with no keypad or display

    2. Model 2: Mid-model, typically identified with limited keypad and display

    3. Model 3: Advanced model, typically identified with full keypad and display

D. All radios shall be provided with the features identified below. Individual discipline requirements are listed in subsequent sections, but will contain these basic features.

    1. P25 Phase 1 and Phase 2 features and operation without additional upgrade

    2. 1024 Talk Group capability

    3. Side-mounted PTT button

    4. Top-mounted on/off volume knob

    5. Top-mounted talkgroup/channel selector

6. Top-mounted programmable function switch

7. Top-mounted emergency button, protected from inadvertent activation

8. Alpha-numeric top and front display (on applicable models), minimum of eight characters (top display) and four lines of 14 characters (front display)

9. Transmit indicator

10. Programmable side buttons

11. Programmable transmit time limiting

12. Advanced Encryption Standard (AES), which will be added to select Memphis Police and Shelby County Sheriff units

E. Battery:

1. Respondents shall provide batteries without cadmium. Pricing shall be provided for:

    a) Lithium-ion

    b) Lithium polymer

2. Batteries shall provide a minimum operational use of 12 hours based on a 5-5-90 duty cycle.

3. Recharge time to full capacity shall not exceed one hour.

4. Respondents shall provide detailed specifications for all batteries proposed, including, at a minimum:

    e) Battery life

    f) Total battery life-cycle expectancy

    g) Recharge time

    h) Dimensions

    i) Weight

    j) Warranty

F. Respondents shall provide optional pricing for all accessories, including, at a minimum:

1. Battery chargers:

    a) Single-bay “smart” battery charger with display and battery conditioning capability

    b) Multiple unit “smart” battery charger with display and battery conditioning capability

    c) Vehicular charger

2. Alternate antennas available

3. Remote speaker microphone

4. Remote speaker microphone with antenna

5. Remote Bluetooth speaker microphone

6. Headset:

    a) Wired

    b) Wireless/Bluetooth

7. Carrying cases/belt clips

8. GPS functionality and associated hardware

G. Respondents shall provide detailed equipment specifications for all proposed portables and accessories, including:

1. Radio dimensions

2. Radio weight with battery

3. Antenna type

4. Frequency channel capacity

5. General features, transmit/receive parameters, and mechanical specifications

11.4.1.1. Memphis Police Department

A. The Memphis Police Department will replace approximately 3,015 XTS 3000/5000 portable radios.

B. Replacement radios shall include the following features in addition to the general requirements listed above:

1. AES in select units
2. GPS receiver
3. Bluetooth interface to audio, biometric monitoring, and other future Bluetooth-capable accessories
4. Wi-Fi capability for wireless programming and communication via Wi-Fi when out of network range
5. Voice and data capability
6. OTAP over both the trunked radio system integrated data and WiFi
7. OTAR of AES-equipped radios
8. Text messaging to the portable
9. Remote monitor, i.e., remotely key the portable

11.4.1.2. Memphis Fire Department

A. The Memphis Fire Department will replace approximately 932 XTS 5000R portable radios.

B. Replacement radios shall include the following features in addition to the general requirements listed above:

1. Fire environment high temperature-resistant housing, speaker microphone, and cable
2. Large knobs for gloved use
3. Water submersible-rated
4. GPS receiver

5. Bluetooth interface to audio, self-contained breathing air (SCBA), biometric monitoring, and other future Bluetooth-capable accessories

6. Wi-Fi capability for wireless programming and communication via Wi-Fi when out of network range

7. Voice and data capability

8. OTAP over both the trunked radio system integrated data and WiFi

9. Personnel accountability report (PAR) response capable with PTT activation and incident commander PAR system

11.4.1.3. Memphis Local Government

A. Memphis local government will replace a total of 797 portable radios.

B. Replacement radios should be a Type 1 radio, equipped with the basic radio functionality, specified above.

C. 512 Talk Group capability

D. Over-the-air Programming

E. GPS receiver chip installed and activated.

F. Animal Control has requested a Second Emergency Button capability which would alert only the Animal Control units of a need for assistance. Respondents shall address this requirement.

11.4.1.4. Shelby County Sheriff's Office

A. The Shelby County Sheriff's Office will replace approximately 1,443 XTS 3000/5000 portable radios.

B. Replacement radios shall include the following features in addition to the general requirements listed above:

1. 1024 Talk Group capability

2. AES in select units

3. GPS receiver

4. Bluetooth interface to audio, biometric monitoring, and other future Bluetooth-capable accessories

5. Wi-Fi capability for wireless programming and communication via Wi-Fi when out of network range

6. Voice and data capability

7. OTAP

8. OTAR of AES-equipped radios

11.4.1.5. Shelby County Fire Department

A. The Shelby County Fire Department will replace approximately 112 XTS 5000 portable radios.

B. Replacement radios shall include the following features in addition to the general requirements listed above:

1. Fire environment high temperature-resistant housing, speaker microphone, and cable

2. Large knobs for gloved use

3. Water submersible-rated

4. GPS receiver

5. Bluetooth interface to audio, SCBA, biometric monitoring, and other future Bluetooth-capable accessories

6. Wi-Fi capability for wireless programming

7. Voice and data capability

8. OTAP

9. PAR response capable with PTT activation

11.4.1.6. Shelby County Local Government

A. Shelby County local government will replace a total of 294 portable radios.

B. Replacement radios should be a Type 1 radio, equipped with the basic radio functionality, specified above. For commonality of spare parts, accessories and batteries, the same model should be proposed as for Sheriff and Fire

11.4.2. *Mobile Radios*

11.4.2.1. Memphis Mobile Radios

A. Respondents shall provide pricing for mobile radios. Memphis will procure approximately 2770 mobile radios for all departments and may procure less or more mobile radios at its discretion.

B. Respondents shall provide pricing for all tiers of mobile radios available.

C. Mobile radios shall be supplied complete with microphone, external speaker, cables, fusing, mounting hardware, coaxial cable, and antennas to provide for a complete installation.

D. Respondents shall provide pricing for both dash-mounted units and remote-mounted units.

E. Features:

1. Full compliance with P25 Phase 1 and Phase 2 features and operation
2. 35 watts power output
3. 1024 Talk Group capability
4. Palm microphone
5. Front-mounted on/off volume knob
6. Talkgroup/channel selector knob
7. Volume control knob
8. Emergency button, protected from inadvertent activation, programmable for other functions
9. Alphanumeric display
10. Transmit indicator
11. Minimum of four programmable buttons on the control head

12. GPS receiver installed

13. Voice and data capability installed

14. Bluetooth installed for interface with wireless microphones and other Bluetooth accessories as may be available

F. Respondents shall provide optional pricing for all accessories, including, at a minimum:

1. AES

2. Cables:

a) Data cables

b) Extension cables

1) Adapters

2) Power cables

3. Remote (trunk) mount option

4. Hand-held control unit

5. Antennas

6. External speakers

7. Public address kits

8. Remote Bluetooth wireless speaker microphones

9. Mobile data interface

G. Respondents shall provide detailed equipment specifications for all proposed mobiles and accessories, including:

1. Radio dimensions

2. Radio weight with battery

3. Antenna type

4. Frequency channel capacity

5. General features, transmit/receive parameters, and mechanical specifications

11.4.2.2. Shelby County Mobile Radios

A. Respondents shall provide pricing for mobile radios. Shelby County will procure approximately 497 mobile radios for Law Enforcement, 398 mobiles for non-Law Enforcement Departments and may procure less or more mobile radios at its discretion.

B. Respondents shall provide pricing for all tiers of mobile radios available.

C. Mobile radios shall be supplied complete with microphone, external speaker, cables, fusing, mounting hardware, coaxial cable, and antennas to provide for a complete installation.

D. Respondents shall provide pricing for both dash-mounted units and remote-mounted units.

E. Features:

1. Full compliance with P25 Phase 1 and Phase 2 features and operation

2. 35 watts power output

3. 1024 Talk Group capability

4. Palm microphone

5. Front-mounted on/off volume knob

6. Talkgroup/channel selector knob

7. Volume control knob

8. Emergency button, protected from inadvertent activation, programmable for other functions

9. Alphanumeric display

10. Transmit indicator

11. Minimum of four programmable buttons on the control head

12. GPS receiver installed

13. Voice and data capability installed

14. Bluetooth installed for interface with wireless microphones and other Bluetooth accessories as may be available

F. Respondents shall provide optional pricing for all accessories, including, at a minimum:

1. AES

2. Cables:

c) Data cables

d) Extension cables

3) Adapters

4) Power cables

3. Remote (trunk) mount option

4. Hand-held control unit

5. Antennas

6. External speakers

7. Public address kits

8. Remote Bluetooth wireless speaker microphones

9. Mobile data interface

G. Respondents shall provide detailed equipment specifications for all proposed mobiles and accessories, including:

1. Radio dimensions

2. Radio weight with battery

3. Antenna type

4. Frequency channel capacity

5. General features, transmit/receive parameters, and mechanical specifications

11.4.3. *Control Stations*

11.4.3.1. Memphis Control Stations

A. Respondents shall provide pricing for replacement control stations and desktop controllers. Memphis will procure 45 control station radios and may procure less or more at its discretion.

B. The current control station radios are consolette stations controlled by digital remote control desksets. Replacement consolettes and desksets shall be replaced on a one-for-one basis. Replacement control stations shall be supplied complete with deskset, consolette radio unit, IP networking equipment. The existing coaxial cable, and antenna systems will be reused.

C. Features and options in the current control station configuration shall be replicated in the new control stations.

D. The backup control stations for the dispatch consoles are mobile radios mounted in the console furniture with their own headset jackboxes and footswitches. These stations shall be replaced with dash mount mobile radios as specified above, but capable of 512 or less talk groups, interfaced to the existing jackboxes, power supplies and footswitches.

E. There are a number of control stations which are mobile radios in a standard desktop control station configuration. These will be replaced with the appropriate replacement radio, and use the existing antenna systems.

11.4.3.2. Shelby County Consolette and Control Stations

A. Respondents shall provide pricing for replacement control stations and accessories. Shelby County will procure 20 consolette-style control station radios and may procure less or more at its discretion.

B. Replacement consolettes shall be replaced on a one-for-one basis. Existing coaxial cable and antenna systems will be reused.

C. Shelby County Consolette Control stations shall be configured with:

1. Desk microphone

2. Headset jackbox for 4 or 6 wire headset

3. Footswitch

D. Consolette stations shall be installed in the following locations:

1. Sheriff Primary Dispatch – 8 Consolettes integrated into the dispatcher workstation as current consolettes

2. Sheriff Backup Dispatch – 5 Consolettes integrated into the workstations

3. Shelby Fire Department Backup Dispatch – 4 Consolettes

4. Shelby Corrections – 2 Consolettes

5. Shelby Radio Shop – 1 Consolette

E. Shelby County Sheriff Office also has 38 XTL5000 mobile radios configured as desktop control stations with microphone and control station power supplies. Five of these control stations are to be equipped with AES encryption. All of these stations shall be replaced on a one for one basis. The existing coaxial cable and antenna systems shall be reused.

F. Shelby County Fire Dispatch has 4 XTS5000 mobile radios mounted in the dispatch console workstation for use as backup control stations in the event of console failure. These stations will be replaced with equivalent capacity Project 25 mobile radios, power supplies and microphones. The existing power supplies and antenna systems shall be reused.

G. Features, functionality and options in the current consolette and control station configurations shall be replicated in the new control station radios.

11.4.4. *Push-to-talk over Cellular*

A. Respondents that offer a PTT over Cellular application for smartphone interface to a P25 trunked system shall provide the detail specifications and costs for the PTT over Cellular gateway and licensing for the user smartphone gateway access and applications.

11.5. SUBSCRIBER TRAINING

A. The selected Respondent shall develop and conduct training programs to allow personnel to become knowledgeable with the subscriber radios.

B. The selected Respondent shall provide:

1. Operator training:

a) The selected Respondent shall provide complete and comprehensive operational training covering features, operation, and special care associated with the subscriber equipment supplied. Operator training shall include the following categories:

1) Portable Unit Operation (structured as Train-the-Trainer)

2) Mobile Unit Operation (structured as Train-the-trainer)

2. Radio programming training:

a) The selected Respondent shall provide complete and comprehensive programming training covering software usage, manipulation of primary features, and fleet map development.

b) A detailed instruction manual should be provided for the programming software, which includes a description of all programming software settings and features.

C. Respondents shall fully describe all proposed training programs, detailing how the Respondent intends to provide training. The training description shall include:

1. A list of all subjects with a description of each

2. Class material to be provided by the Respondent

3. Number of classes

4. Class duration

5. Need for recurring training

6. Class size

7. Class cost

D. All training shall be conducted at “to be determined” locations within Shelby County. The selected Respondent shall coordinate with the City regarding number of attendees and schedule.

E. Classes shall be scheduled as near to system cutover as possible.

F. The selected Respondent shall train Memphis and Shelby County employees or designated individuals. In some cases, a Train-the-trainer approach will be used to train other users.

G. The selected Respondent shall provide all instructional material, including printed manuals, audio, video, interactive self-paced personal computer programs, and complete equipment operating instructions for all technical and operational training classes. Actual and/or exact model and series of equipment being delivered shall be made available for hands-on use and operation during training. All instructional material shall be subject to the approval of the City and shall become property of same.

11.6. SUBSCRIBER WARRANTY, MAINTENANCE, AND SUPPORT

11.6.1. *Warranty*

A. Proposed subscriber equipment shall have a warranty period of one year. The one-year warranty period shall commence upon subscriber installation and deployment.

B. An option for extended warranty of three years following the initial warranty period (total of four years) shall be provided.

C. The selected Respondent shall provide a single toll-free telephone number that answers 24 hours a day, 7 days a week, 365 days a year for service requests and warranty claims.

D. Respondents shall state in their proposal the name, address, and capabilities of the service station(s) providing warranty service.

E. During the warranty period, all equipment needing factory or depot repairs shall be tracked to and from the factory/depot by a comprehensive tracking system put in place by the selected Respondent.

11.6.2. *Maintenance*

A. The selected Respondent shall maintain and repair all subscriber equipment, hardware, and software throughout the implementation/migration and warranty periods.

B. The City reserves the right to have technical staff on-site to witness, and, if desired, assist in the maintenance and troubleshooting procedures. This does not relieve the selected Respondent from warranty and maintenance responsibility as defined in this RFP.

11.6.3. *Parts Availability*

A. From the date of final acceptance to the seventh anniversary of the date of final acceptance, the selected Respondent shall maintain replacement parts for all delivered equipment.

B. In the event the selected Respondent plans to discontinue stocking any part required for maintenance after the seventh anniversary of acceptance, the selected Respondent shall send written notice to the City 24 months prior to the date of discontinuance to allow for last-time buys and replenishment.

C. All parts ordered on a priority basis shall be delivered within 24 hours after placing an order. The selected Respondent shall provide year-round, 24-hour ordering facilities via telephone, internet, e-mail, and fax service.

11.6.4. *Spare Equipment*

A. Respondents shall propose to the City, as an option, recommended spare parts for the subscriber equipment.

B. The list of spare parts shall include, but is not limited to:

1. Any vendor-identified FRUs
2. Power supplies
3. Test measurement, calibration, and repair kits
4. Diagnostic equipment to support City maintenance activities

C. Spares for less critical items shall also be enumerated.

D. The list shall include items that will rapidly and completely restore all functionality with the least amount of effort, e.g., board replacement instead of troubleshooting to the component level when a critical unit has failed.

E. The quantities of spares in the list shall be appropriately sized to accommodate equipment quantities in the system.

F. The list shall define the primary equipment category each spare kit supports, e.g., batteries, antennas, cables, etc.

G. The system engineering design documentation shall include a narrative on the Respondent's ability to replace failed units from stock and the process and timing to repair, replace, and return failed units delivered for repair.

H. System engineering design documentation shall include the life cycle of equipment, parts, and other maintenance support for the system.

11.7. SUBSCRIBER IMPLEMENTATION, TESTING, AND ACCEPTANCE

11.7.1. *General*

A. The selected Respondent shall perform all programming, pre-installation testing, and installation of new equipment and removal of old equipment. The selected Respondent shall attend biweekly project and installation planning meetings as deemed necessary by the City prior to and during installation. Additional meetings may be scheduled at the discretion of the City.

B. If any changes in the overall timeline occur, the selected Respondent shall update the project schedule for discussion during these project meetings.

C. The selected Respondent shall provide written minutes of all meetings no later than five business days after the meeting.

11.7.2. *Subscriber Radio Cutover Plan*

A. The selected Respondent shall be responsible for coordinating user radio cutover and implementation with the system infrastructure vendor, if different, and the City.

B. Execution of the cutover plan shall ensure that new subscriber radios are brought online with minimum interruption to all existing systems and communications.

C. During final design, the selected Respondent shall coordinate a cutover strategy with the system infrastructure vendor, if different, describing how the radio system shall be phased over into a fully operational system.

1. The selected Respondent shall successfully complete all tests and training prior to the actual cutover of systems.

2. The selected Respondent shall provide the necessary labor to cutover from existing systems to the proposed system.

3. The plan shall include the schedule and procedures associated with the transition of each operational user group. The plan shall specifically address how the existing users will begin using the new system with minimal operational impact.

4. The plan shall provide detailed component or subsystem cutover plans, and specifically delineate between systems that affect and do not affect ongoing operations.

5. The City reserves the right to approve and change the cutover plan as it relates to any or all system components.

11.7.3. *Subscriber Installation*

A. Installation shall include a complete, tested subscriber fleet to include placement of associated cabling, appropriate vehicular system layout, and terminal connections. The selected Respondent shall provide associated power supplies and any other hardware, adapters, and/or connections to deliver a complete operable system to the City at the time of acceptance.

B. The selected Respondent shall be responsible for unique mobile radio installations, including interfaces with light bars, headsets, remotes, sirens, etc.

C. Qualified, adequately trained personnel familiar with this type of work shall perform all installations. All installations shall be performed by factory-authorized or selected Respondent-affiliated service shops. Other shops or installers may be used upon mutual agreement between the City and the selected Respondent. Respondents shall provide the names of the service shops, a summary of their experience, and a list of five references (minimum) for each proposed shop.

D. Prior to the start of the subscriber installation, the selected Respondent shall participate in a mandatory project site survey with the City to confirm actual equipment location within each vehicle and space. At that time, the exact equipment locations shall be determined and documented by the selected Respondent and agreed to by the user agency and applicable City technical representative.

E. The selected Respondent shall provide and pay for all materials necessary for the execution and completion of all work. Unless otherwise specified, all materials incorporated into the permanent work shall be new and shall meet the requirements of this RFP. All materials furnished and work completed shall be subject to inspection by the City.

F. Equipment supplied as spare equipment shall not be used for installation of the proposed system. All spare equipment shall be supplied in an unused condition.

G. All equipment and devices shall be cleaned internally and externally, and all damaged finishes shall be repaired.

H. Worksites shall be left neat and broom swept upon completion of work each day. All shelter floors shall be thoroughly cleaned and all scuff marks and abrasions shall be removed prior to acceptance. All trash shall be removed weekly.

I. Inspection:

1. The City shall inspect installations upon completion of the installation or group of installations. Any deficiencies shall be documented on a single punch list and provided to the selected Respondent for resolution.

2. Final acceptance testing shall not commence until all punch list items are resolved.

12. TEST EQUIPMENT

12.1. TEST EQUIPMENT TO BE PROVIDED

A. The City of Memphis and Shelby County both provide test, troubleshooting and tuning of radios in their respective radio shops.

B. The new Project 25 system will require additional test equipment to test, troubleshoot, and tune the new generation of subscriber radios and infrastructure. Respondents shall provide a list of recommended test equipment, with firm prices, required to properly maintain their infrastructure, microwave and subscriber mobile and portable radios.

C. Respondents shall also provide unit pricing for the following desired test equipment in additional to their recommended list, above;

1. Diagnostix Model DX-2002 Waveform Analyzer with applicable software for the respondent’s proposed radios.

2. Cobham (Aeroflex) Model 8800S Digital Radio Test Set with software and interface to the respondent’s proposed subscriber radios.

3. A product for Radio Location using Time Difference of Arrival (TDoA). LocusUSA Safepoint system or equivalent.

13. CURRENT SYSTEM TRADE-IN

Respondents shall propose a trade in value for the current system. Trade-in values shall be stated for the following equipment;

- Gold Elite Consoles including operating positions, Central Electronics Banks, Ambassador/Embassy switches.
- MZC3600 Zone controllers and associated equipment
- Digital Interface Units
- AstroTAC Prime Site Equipment
- MTC3600 System and Site controllers
- Quantar Repeaters.(Trade-In each)
- XTS1500 Portables (Trade-In each)
- XTS2500 Portables (Trade-In each)
- XTS3000 Portables (Trade-In each)
- XTS5000 Portables (Trade-In each)
- XTL1500 Mobiles (Trade-In each)
- XTL2500 Mobiles (Trade-In each)
- XTL5000 Mobiles (Trade-In each)
- XTL5000 Consolette Stations (Trade-In each)
- MCC3000 Digital Controllers (Trade-In each)
- MOSCAD System
- Harris Constellation 6 GHz & 18 GHz Microwave System
- Motorola RNC3000 DataTAC Controller
- Motorola MBEX Telephone Interconnect
- Full Vision System Management system and associated system management systems

Glossary of Terms and Acronyms

agency	Term that applies generically to any local, state, or federal entity or organization, such as a department, division, city/town, or bureau. Includes government, quasi-government, and private groups.
ANSI	American National Standards Institute
APCO	Association of Public-Safety Communications Officials-International
ASTM	American Society of Testing Materials
ATPC	Automatic Transmit Power Control
backhaul	The transporting of radio communications traffic between distributed sites (typically access points) and more centralized points of presence.
bandwidth	The capacity of a channel to carry signals. The amount of spectrum required to transmit a signal without distortion or loss of information.
BER	Bit Error Rate – A measure of the number of errors in received transmissions when compared to the original transmission, frequently expressed as a percentage.
Bit	Binary digit
CAI	Common Air Interface
CATP	Coverage Acceptance Test Plan
channel	The route through which a message is sent. A connection between initiating and terminating nodes of a circuit. A single path provided by a transmission medium via an electrical separation, such as by frequency or frequency pairs.
communications	Information transfer among or between users. In public safety communications, the ability of public safety agencies to talk across agencies.
connectivity	The complete path between two terminals.
conventional	A radio system with dedicated, single-purpose channels (can be shared between several users with different operational needs; e.g., fire and police). A user must select the specific channel to be used.

coverage	The geographic area included within the range of a wireless radio system.
CPC	Channel Performance Criterion
DAQ	Delivered Audio Quality
dB	Decibel
DC	Direct Current
digital	Radio transmission method that replaces analog systems and transmits its signal in binary 1's and 0's the same as a computer. One major difference is that digital signals do not degrade gradually the way analog does as the distance between the transmitter and receiver increases.
DS-0	A basic digital signaling rate of 64 kbit/s, corresponding to the capacity of one voice-frequency-equivalent channel. The DS0 rate, and its equivalents E0 and J0, form the basis for the digital multiplex transmission hierarchy in telecommunications systems used in North America.
DS-1	Digital Signal, Level 1
DS-3	Digital Signal, Level 3
DTMF	Dual-tone Multi-frequency
EIA	Electronic Industries Alliance (publisher of standards)
encryption	The reversible transformation of data from the original (plain text) format to a difficult to interpret format as a mechanism for protecting its confidentiality, integrity, and sometimes its authenticity. Encryption uses an encryption algorithm and one or more encryption keys.
ERP	Effective Radiated Power
FAA	Federal Aviation Administration
FATP	Final Acceptance Test Plan
FCC	Federal Communications Commission
first responders	The first professionals called to an incident or emergency that provide immediate support services during prevention, response, and recovery operations.

frequency	The number of cycles or events of a periodic process in a unit of time.
frequency bands	The spectrum of transmission space where mobile radio systems operate in the United States. They are from low to high: High HF 25–29.99 MHz Low VHF 30–50 MHz High VHF 150–174 MHz Low UHF 450–470 MHz UHF TV Sharing 470–512 MHz 700 MHz 764–776 & 794–806 MHz 800 MHz 806–869 MHz 2.4 GHz 4.9 GHz
FRU	Field Replaceable Units
gateway	A device that can transparently interconnect radio audio paths so that agencies can patch into each other's radio channels in real time. This can be done at the baseband level or using IP. A gateway provides interconnection between two networks with different communications protocols.
GHz	Gigahertz
GoS	Grade of Service
GUI	Graphical User Interface
HF	High Frequency
HVAC	Heating, Ventilation, and Air Conditioning
ID	Identification
IEEE	Institute of Electrical and Electronic Engineers
infrastructure	Dedicated telecommunications networks; the hardware and software needed to complete and maintain a public safety communications system
interference	Extraneous energy, from natural or man-made sources, that impedes the reception of desired RF signals.
interoperability	The ability of diverse systems and organizations to work together (inter-operate). In public safety, the ability of personnel to exchange voice and data communications with staff from other agencies, on demand and in

	real-time.
intranet	A private computer network that uses Internet technologies to share an organization's information or operational systems with its employees in a secure manner.
IP	Internet Protocol
ISSI	Inter-RF Sub-system Interface
kHz	Kilohertz (1000 Hertz)
LAN	Local Area Network
LCD	Liquid Crystal Display
LMR	Land Mobile Radio – A public or private radio service providing two-way communication, service paging and radio signaling on land.
Mbps	Megabit per second (1 million bits per second)
MHSB	Monitored Hot Standby
MHz	Megahertz
MPE	Maximum Permissible Exposure
NAD	National American Datum
narrowband	In LMR systems, the FCC has mandated the reduction of channel bandwidths from 25 kHz to 12.5 kHz, doubling the number of available channels. All systems operating on 25 kHz bandwidth must be operating on narrowband by January 1, 2013, when all public safety users must cease operation of wideband equipment on or before that date. The FCC has further mandated narrowbanding to 6.25 kHz or equivalent by a date yet to be determined.
NEC®	National Electric Code®
NEMA	National Electrical Manufacturer’s Association
NFPA	National Fire Protection Association
NMI	Network Management Interface

NMS	Network Management System
NMT	Network Management Terminal
OET	Office of Engineering & Technology
PC	Personal Computer
Project 25 (P25) or APCO-25	A suite of standards for digital radio communications for use by federal, state/province and local public safety agencies in North America to enable them to communicate with other agencies and mutual aid response teams in emergencies.
psig	Pounds per square inch gauge
PTT	Push-to-talk
Public Safety spectrum	Specific bands of frequencies set aside by the FCC for use by public safety agencies. They are: Low Band (25–50 MHz) VHF High Band (150–174 MHz) 220 Band (220–222 MHz) UHF Band (450–470 MHz) 700 Band (764–776 and 794–806 MHz) 800 Band (806–824 and 851–869 MHz) 4.9 GHz Band
QA/QC	Quality Assurance/Quality Control
R56	Motorola *Standards and Guidelines for Communication Sites*
receiver	The component(s) of a radio device that converts the radio waves into audible signals.
repeater	A special receiver/transmitter combination that receives a signal on one frequency and retransmits a new signal on another frequency, usually within the same frequency band, sometimes referred to as a relay station.
Respondent	Any individual or entity bidding on the right to supply products and services in response to this RFP.
RF	Radio Frequency
RFP	Request For Proposal

RTU	Remote Terminal Unit
SAT	System Acceptance Testing
selected Respondent	Any individual or entity selected from among all Respondents to supply products and services in response to this RFP.
SoR	Statement of Requirements
spectrum	The range of electromagnetic radio frequencies that can be decomposed into frequency components, used in the transmission of sound, data and television.
subscriber	User, customer on a network.
subscriber unit	User's equipment (usually a mobile or portable radio).
talkgroup	Radio system users assigned to a specific group of users who regularly communicate with each other.
TDMM	Telecommunications Distribution Methods Manual
TIA	Telecommunications Industry Association
trunked	A radio system with a group of channels available and assigned as needed to specific "groups" or operations. The channels are programmed for automatic system assignment while in-use, and then released for other users. A trunked system maximizes channel utilization.
TSB	Telecommunications Systems Bulletin
TTA	Tower Top Amplifier
turnkey	Entire system with hardware and software assembled and installed by a vendor and sold as a package.
TVSS	Transient Voltage Surge Suppression
UHF	Ultra High Frequency
UL	Underwriters Laboratory
UPS	Uninterruptible Power Supply
USGS	U.S. Geological Survey

VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
voting receiver	Multiple remote receivers tied together through a comparator device at a transmitter site to improve portable coverage, signal strength is compared from each receiver, and the best receiver becomes the receiver during a specific transmission.
WAN	Wide Area Network
WBS	Work Breakdown Structure

Appendix A: Proposal Form

The undersigned Respondent agrees, if awarded a contract by The City of Memphis, Tennessee, to provide an **800 MHz Public Safety Radio System** as specified in accordance with the foregoing Request for Proposal for the price specified below.

THIS PROPOSAL ADDRESSES THE FOLLOWING NETWORK COMPONENTS (check each as applicable)

800 MHz Trunked P25 Radio System	____
Dispatch Console System	____
Network Management	____
Digital Microwave Network	____
Site Development	____
Towers	____
Shelters	____
Generators	____
P25 Subscriber Units	____

TOTAL PROPOSAL PRICE

TOTAL BASE PROPOSAL AMOUNT……..$_____

Remainder of page intentionally left blank.

_____
NAME OF RESPONDENT (type or print)

_____
ADDRESS
_____

_____
AUTHORIZED SIGNATURE

AFFIX CORPORATE

_____
SEAL HERE PRINT NAME AND TITLE OF SIGNER
(If proposer is a corporation)

___(_____)_____
AREA CODE & TELEPHONE

___(_____)_____
FAX NUMBER

Respondent is (check one):

_____Corporation incorporated in the State of _____

_____General Partnership

_____Limited Partnership

_____Sole Proprietorship

_____Other (specify) _____

Appendix B: Proposal Pricing Forms

See Excel Spreadsheets.

Appendix C: Candidate Site List

Site Name	ASR	Site Latitude (N)	Site Longitude (W)	Existing Heights (f)	Proposed Heights (f)
Fire Station 7	1051806	35°08’31.30”	90°01’34.30”		
Fire Station 31	1051809	35°14’30.30”	89°59’33.30”		
Fire Station 45	1051807	35°00’25.30”	90°06’13.30”		
Fire Station 51	1051808	35°10’02.30”	89°51’53.30”		
Fire Station 52	1051805	35°02’55.30”	89°50’27.30”		
Armour Center	1051801 1051804	35°07’55.18”	89°58’19.12”		
Locke	1246164	35°19’58.00”	90°01’41.60”		
Fisherville	1246166	35°10’50.89”	89°39’43.46”		
Redwood	1246163	35°22’32.80”	89°43’55.40”		
Shelby Farms	1044785	35°09’17.30”	89°51’28.30”		

Appendix D: Compliance Matrix

Memphis/Shelby County
RFP Compliance Matrix

RFP Section Number	Complies	Does Not Comply	Complies with Exception	Explanation of Exception/Comments

RFP Section Number	Complies	Does Not Comply	Complies with Exception	Explanation of Exception/Comments

Appendix E: Non-Collusion Affidavit

The Proposer, by its officers and its agents or representatives present at the time of filing this Proposal, being duly sworn on their oaths say, that neither they nor any of them have in any way, directly or indirectly, entered into any arrangement or agreement with any other Proposer, or with any officer of the Owner or Owner's representative whereby such affiant or affiants or either of them has paid or is to pay such other Proposer or officer any sum of money, or has given or is to give to such other Proposer or officer anything of value whatever, or such affiant or affiants or either of them has not directly or indirectly, entered into any arrangement or agreement with any other free competition into the letting of the contract sought for by the attached prices that no inducement of any form or character other than that which appears on the face of the Proposal will be suggested, offered, paid or delivered to any person whomsoever to influence the acceptance of the Proposal or awarding of the Contract, nor has this Proposer any agreement or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person in any way or manner, any of the proceeds of the Contractor sought by this Proposal.

Submitted By:

Firm Name_____
Authorized Signature_____
Date_____

SIGNATURES

If PROPOSER is:

A. An Individual
By

_____

_ **(SEAL)**
(Individual's Name)

Doing business as

_____

Business Address:

_____

_____

_____

Phone Number:

_____

B. A Partnership
By

_____

(SEAL)
(Firm Name)

_____

_____

(General Partner)

Business Address:

_____

_____

_____

Phone Number:

_____

C. A Corporation
By

_____

(SEAL)
(Corporation Name)

_____

(State of Incorporation)

By

_____

(Name of Person Authorized to Sign)
Title

_____

Attest

_____

(Secretary)

Business Address:

_____

_____

_____

Phone Number:

_____

D. A Joint Venture

By

_____

(Name)

Business Address:

_____

_____

_____

By

_____

(Name)

Business Address:

_____

_____

_____

Each joint venture member must sign. The manner of signing for each individual partnership and corporation that is party to joint venture should be in manner indicated above.

Appendix F: CMEM Standard Service Agreement

STANDARD SERVICE AGREEMENT

CMEM STANDARD SERVICE AGREEMENT (HEADER)

This Agreement is made and entered into this _____, by and between [@ CONTRACTOR NAME @], hereinafter called the "Contractor" and the City of Memphis, a municipal corporation of the State of Tennessee, hereinafter called the "City":

WITNESSETH

WHEREAS, the City, by and through its [@ DIVISION NAME @], has the need for [@ SERVICES TO BE PROVIDED @]; and **WHEREAS,** the Contractor has the knowledge and expertise to provide such services; and **WHEREAS,** the parties desire to enter into an agreement setting forth the terms and conditions under which the Contractor shall provide said services. **NOW THEREFORE,** for and in consideration of the mutual promises and covenants contained herein and for other good and valuable consideration, the parties desire to enter into Agreement and hereby agree as follows:

CMEM STANDARD SERVICE AGREEMENT (SCOPE OF SERVICES)

SCOPE OF SERVICES. The Services to be provided in connection with this Agreement shall include, but not be limited to, those items listed in the Scope of Work, which is attached hereto and incorporated herein as Exhibit A (the "Services").

TERM

This Agreement shall not be binding upon the parties until it has been signed first by the Contractor and then by the authorized representatives of the City in accordance with applicable ordinances, laws and regulations.

The Initial Term of this Agreement shall commence beginning [@ CONTRACT BEGIN DATE @] and shall end on the earlier of [@ CONTRACT END DATE @] or until all goods/services herein have been provided to the City ("Initial Term"), subject to the availability and appropriation of funds to finance the same and the successful operation of the program.

The City shall have the option to extend the Initial Term for [@ OPTION YEARS @] additional one-year periods (the "Option Periods"), subject to the appropriation of funds by the Memphis City Council and mutual agreement of the parties. The Initial Term and the exercised Option periods are collectively referred to hereinafter as the "Term."

CMEM SERVICE AGREEMENT (PAYMENT TERMS AND CONDITIONS)

INVOICES. The Contractor shall submit original invoices, or copies of original invoices certified as such by the Contractor, on the Contractor's letterhead and in form and substance acceptable by the City and with all necessary supporting documentation, to the City. The invoice shall describe the services provided, list the price per unit, reflect any applicable terms of payment, and show the contract number to which it relates. Unless the contract number is shown on the invoice, it may be returned to the

Contractor. Invoices shall be submitted to: [@ DIVISION NAME @], [@ INVOICE ADDRESS @]; Memphis, Tennessee [@ ZIP CODE - INVOICE @]; Attn: [@ CITY CONTACT/REPRESENTATIVE @]

COMPENSATION. Unless the City has good faith and reasonable objections to the Contractor's invoice(s), the City shall compensate the Contractor, based on invoices submitted by the Contractor, the sum total not to exceed $[@ CONTRACT AMOUNT @] (USD) (the "Fee") during the term of the Agreement, which shall include all reimbursable expenses.

The City shall use its best efforts to remit payment based on the Contractor's invoice within thirty (30) days after receipt of accurate invoice and approval by the City. The City is not obligated to pay, and may withhold from payment, any amounts the City has in dispute with the Contractor based on the Contractor's non-performance, unsatisfactory performance or negligent performance of any services hereunder.

TRAVEL EXPENSES. Where travel expenses are otherwise allowed and payable herein, such travel expenses shall be in accordance with the City's Travel Policy and Procedures, as may be amended from time to time. This includes advance written travel authorization, submission of travel claims, documentation requirements, and reimbursement rates. No travel advances will be made by the City.

TAX PAYMENTS. The City of Memphis is exempt from Federal Excise, State and Local Taxes on all purchases and upon request, will issue tax exemption certificates to the Contractor. Contractor shall be solely responsible and liable for any taxes and business license fees assessed or imposed by any government having jurisdiction over the work and/or goods to be provided herein.

PAYMENT DOES NOT IMPLY ACCEPTANCE OF WORK. The payment of an invoice shall not prejudice the City's right to object to or question any invoice or matter in relation thereto. Such payment by the City shall neither be construed as acceptance of the work nor as final approval of any of the costs invoiced therein, and the City's payment shall not relieve the Contractor from its obligation to replace or correct any work that does not conform to this Agreement, even if the unsatisfactory character of such work may have been apparent or detected at the time such payment was made. Work, data or components that do not conform to the requirements of this Agreement shall be rejected by the City and replaced by the Contractor, without delay or additional cost to the City.

If the Contractor receives payment from the City for a service or reimbursement that is later disallowed or rejected by the City or another governmental entity on the basis of audit or monitoring, the Contractor shall promptly refund the disallowed amount to the City upon the City's request. At its option, the City may offset the amount disallowed from any payment due to the Contractor under this Agreement or any other agreement.

FINAL CONTRACT INVOICE. The Contractor shall submit to the City a final contract invoice within 45 calendar days from the termination date of the contract, for any services provided pursuant to this Agreement. The Contractor further acknowledges and agrees the City will not be responsible for any Contractor invoices, pertaining to this Agreement, submitted to the City after the final contract invoice. The Contractor shall close out it accounting records at the end of the Agreement period in such a manner that reimbursable expenditures and revenue collections are NOT carried forward.

CMEM SERVICE AGREEMENT (GENERAL TERMS AND CONDITIONS)

INCORPORATION OF WHEREAS CLAUSES. The foregoing whereas clauses are hereby incorporated into this Agreement and made a part hereof.

TITLE & RISK. The title and risk of loss of any goods hereunder shall not pass to the City until the City actually receives and takes possession of the goods at the point or points of delivery. The Contractor/successful bidder shall assume all liability and responsibility for delivery of such goods in good condition to the City.

PATENT INDEMNIFICATION. The Contractor warrants that any goods/services furnished hereunder do not infringe or violate any patent, trademark, copyright, trade secret, or any other proprietary right of any third party; that it shall defend all suits that may arise with respect thereto; and that it shall indemnify, defend, save and hold harmless the City, its officials, employees, agents, successors and assigns, from and against all liabilities, suits, claims, damages, costs or expenses, including without limitation attorney and expert witness fees, for or by reason of any actual or alleged claim the goods/services purchased by City hereunder infringe any patent, copyright, or is a violation of trade secret disclosure laws, whether by reason of the Contractor's purchase or otherwise. This indemnification obligation shall survive the expiration or termination of this Agreement.

TRANSPORTATION CHARGES/F.O.B. DELIVERY. All pricing is F.O.B. destination, in which Contractor shall be responsible for freight, transportation costs, and all incidental charges, unless delivery terms are specified otherwise in the bid and agreed to by the City. In the event shipping other than FOB destination is allowed by the City, The City agrees to reimburse the Contractor for transportation costs in the amount specified in the Contractor's bid, or actual costs, whichever is lower, provided the City shall have the right to designate what method of transportation shall be used to ship the goods.

SHIPMENTS. Substitutions will not be accepted, unless otherwise specified herein. Partial shipments may be allowed unless otherwise stated in writing by City, however, full shipment of all items ordered hereunder must be completed by the date specified in this Agreement or this Agreement will be subject to
cancellation by the City. The Contractor shall not ship excess quantities without the City's prior written approval.

REPORTS. Upon request, the Contractor shall prepare and submit reports of its activities, funded under this agreement, to the originating department of the City. The reports shall include an itemization of the use of the City's funds, inclusive of specific services delivered by the Contractor. Any such reports provided to the City shall be prepared with the understanding that the City may make such reports available to the public.

In addition, Contractor shall submit and, as necessary, update subcontractor information (including but not limited to payments thereto), for **any and all subcontractors** used on City project(s), in the City's compliance tracking software, B2GNow. The City shall have the right to withhold future disbursement of funds under this Agreement and any future Agreements until the requirements of this provision have been met.

ENTIRE AGREEMENT. This Agreement constitutes the full and final understanding of the parties with respect to the subject matter hereof and supersedes and replaces any and all prior or contemporaneous agreements or understandings, whether written or oral, express or implied, between the parties with respect to the subject matter of the Agreement.

STANDARD OF PERFORMANCE. All services by the Contractor shall be performed in compliance with the specified requirements, in a manner satisfactory to the City, and in accordance with the generally accepted business practices and procedures of the City and pursuant to the governing rules, practices and regulations of the industry, based on the type of services performed hereunder.

HEADINGS. Titles and headings used herein are for the convenience of reference only and shall be disregarded completely in the interpretation and validity of this Agreement or any of its terms.

MODIFICATION AND AMENDMENT. This Agreement shall be amended or modified only by a written document signed by the parties hereto, in accordance with applicable laws and regulations.

CONFIDENTIALITY. While performing work under this Agreement, the Contractor may gain access to proprietary and/or confidential information that, if disclosed to third parties, may be damaging to the City or its officials or employees. Such information shall include materials considered to be confidential information as a matter of law (e.g., personnel records), and shall also include (i) all materials in any form developed or created by the City related to funding and financial and business information; (ii) all information owned, possessed or used by the Contractor, which is communicated to, learned, developed or otherwise acquired by the Contractor in the performance of the Services for the City; (iii) the terms, conditions and pricing contained herein; and (iv) any other information that the Contractor has been advised by the City is confidential, privileged or proprietary. Confidential information, as used in this Agreement, shall not include (i) information in the Contractor's possession prior to disclosure by the City; (ii) information generally available to the public or that becomes available to the public through a source other than the City, or (iii) information that was rightfully obtained by the Contractor from a third party who is under no obligation of confidentiality to the City with respect to such information. The Contractor agrees that it will accept and hold confidential information obtained from the City in confidence at all times during and after termination of this Agreement. The Contractor shall neither use nor disclose such information, except as provided in this Agreement or as required by law, without the prior written permission of the City.

The Contractor acknowledges and agrees that a breach of this section by the Contractor will cause the City irreparable injury and damage; therefore, the Contractor expressly agrees that the City shall be entitled to injunctive or other equitable relief in any court of competent jurisdiction to prevent or otherwise restrain a breach of this Agreement. The Contractor agrees that it will disclose confidential information only to those employees who have a right to know, and shall require its employees, agents, and subcontractors to comply with the requirements of this provision and the requirements of the provisions herein titled "Public Statements" and "Rights in Data."

PUBLIC STATEMENTS. The Contractor shall not make any announcement, release any information, or authorize or participate in any interview concerning this Agreement and the goods and/or services required herein, without obtaining prior written consent from the City. The Contractor shall require its

employees, agents, and subcontractors to comply with the requirements of this provision. This provision shall survive the expiration or termination of this Agreement.

RIGHTS IN DATA. The Contractor agrees that all reports, studies, plans, models, drawings, specifications, and any other information or data of any type produced under this Agreement, whether or not the same is accepted or rejected by the City, shall remain the property of the City and shall not be published by the Contractor or any other party without the express prior written consent of the City. In implementing the foregoing, the Contractor hereby grants and assigns to the City all rights and claims of whatever nature, whether now or hereafter, arising in and to any and all of such reports, studies, plans, models, drawings, specifications, and other information or data and shall cooperate fully with the City in any steps the City may take to obtain copyrights, trademark or like protections with respect thereto. The signing of this Agreement shall constitute a complete transfer of ownership, intellectual property and copyright of all documents from the Contractor to the City upon the Contractor's delivery of such documents and/or information to the City or upon completion of the Project, whichever occurs first. The Contractor shall not construe such transfer as a grant for usage nor can the Contractor revoke it.

EMPLOYMENT OF CITY WORKERS. The Contractor shall not engage, on a full, part-time or any other basis during the term of this Agreement, any professional or technical personnel who are or have been at any time during the term of this Agreement in the employ of the City.

CONTRACTOR'S PERSONNEL. The Contractor certifies that it presently has adequate qualified personnel to perform all services required under this Agreement and that all work performed under this Agreement shall be supervised by the Contractor. Contractor will make its personnel aware of and cause them to comply with the City's policies that have been made known to Contractor while performing pursuant to this Agreement. The Contractor further certifies that all of its employees assigned to perform any work hereunder shall have such knowledge and experience as required to perform the duties assigned to them. Any employee of the Contractor who, in the opinion of the City, is incompetent, whose conduct becomes detrimental to the work, or whom the City deems to be unsatisfactory for any reason, shall immediately be removed from association with the services hereunder per the City's request. Upon such request, the Contractor shall use all reasonable efforts to promptly replace such employee(s) with substitute employee(s) having appropriate skills and training. Contractor is responsible for the acts or omissions of its personnel under or relating to this Agreement.

The Contractor shall be solely liable and responsible for providing to, or on behalf of, all persons performing work pursuant to this Agreement, all employee compensation and benefits. The City shall have no liability or responsibility for the payment of any salaries, wages, unemployment benefits, health, welfare and disability benefits, Federal and local taxes, or other compensation, benefits or taxes for any personnel provided on behalf of the Contractor. In addition, the Contractor shall be solely liable and responsible for any and all workers' compensation benefits to any person as a result of injuries arising from or connected with any work performed by or on behalf of the Contractor pursuant to this Agreement.

INDEPENDENT CONTRACTORS. Nothing in this Agreement shall be deemed or construed to represent that the Contractor, or any of the Contractor's employees or agents, are the agents, representatives, or employees of the City. The Contractor acknowledges that it is an independent contractor over the details and means for performing the services hereunder. Anything in this Agreement which may

appear to give the City the right to direct the Contractor as to the details of the performance of its obligations hereunder or to exercise a measure of control over the Contractor is solely for purposes of compliance with local, state and federal regulations and means the Contractor will follow the desires of the City only as to the intended results of the scope of this Agreement.

It is further expressly agreed and understood by the Contractor that neither it nor its employees or agents shall hold itself out contrary to the terms of this paragraph, and the City shall not be liable for any representation, act or omission of the Contractor contrary to the provisions hereof.

TERMINATION

1. It shall be cause for the immediate termination of this Agreement if, after its execution, the City determines that either:

the Contractor or any of its principals, partners or corporate officers, if a corporation, including the corporation itself, has plead nolo contendere, or has plead or been found guilty of a criminal violation, whether state or federal, involving, but not limited to, governmental sales or purchases, including but not limited to the rigging of bids, price fixing, misappropriation of government funds, or any other collusive and illegal activity pertaining to bidding and governmental contracting; or

the Contractor subcontracted, assigned, delegated, or transferred its rights, obligations or interests, voluntarily or involuntarily, under this Agreement without the City's consent or approval; or

the Contractor has filed bankruptcy, has been adjudicated bankrupt, become insolvent or made an assignment for the benefit of creditors, or a receiver, or similar officer is appointed to take charge of all or part of the Contractor's assets.

2. The City may cancel/terminate this Agreement, in whole or in part, upon providing written notice to the Contractor of the City's intention to terminate the Agreement as a result of Contractor's failure to provide the goods and/or services specified under this Agreement or in violation(s) of any of the terms herein, and the Contractor has failed to cure such breach within [@ NUMBER OF DAYS TO CURE BREACH @] business days of such notice. The City may reject the goods and/or services and cancel this Agreement for any goods/services rendered or to be rendered hereunder. At its option, City may return the rejected portion of such goods to Contractor at its expense or hold the same for such disposal as Contractor shall indicate. In the event of any such rejection/termination, the City shall, at the City's option, have the right to obtain like goods and/or services elsewhere or to take over the work and prosecute the same to completion, both at the Contractor's expense; and in such event, the City may take possession of and utilize in completing the work, such materials, appliances, etc. as may be on the site of the work and necessary therefore. The Contractor shall be liable to the City for any loss, damage, or additional cost incurred thereby, including but not limited to any difference between the cost for procuring such like services and the price specified herein, attorneys' fees and court costs.

3. Notwithstanding the foregoing or any section herein to the contrary, the Contractor shall not be relieved of liability to the City for damages sustained by the City by virtue of any breach of the Agreement by the Contractor, and the City may withhold any payments to the Contractor, for the purpose of setoff, until such time as the exact amount of damages due the City from the Contractor is determined.

4. The City may, in its sole discretion, suspend and/or terminate this Agreement for convenience upon giving [@ NUMBER OF DAYS TO TERMINATE CONTRACT FOR CONVENIENCE @] business days prior written notice to the Contractor. In the event a purported termination for cause by the City is in error, then such termination may, at the City's sole discretion, be deemed to be a termination for

convenience under this section. In the event of such termination, the Contractor shall be entitled to receive just and equitable compensation, as determined by the City, for any satisfactory authorized work performed in accordance with the Agreement up to the termination date; but in no event shall the City be liable to the Contractor for expenses incurred after the termination date. All goods accepted by City or services completed by the Contractor prior to the Termination Date shall be documented and all tangible work documents shall be transferred to the City prior to payment for services rendered, and shall become the sole property of the City. Such termination by the City shall not be deemed a Breach of Contract by the City, and the Contractor shall not be compensated for any anticipatory profits, or other damages of any description, that have not been earned as of the date of termination.

5. The Contractor shall deliver to the City all hard copy and electronic files maintained on behalf of the City within thirty (30) calendar days of termination of this Agreement. Upon reasonable request, the City reserves the right to obtain such information prior to the termination of this Agreement.

COMPENSATION FOR CORRECTIONS. No compensation shall be due or payable to the Contractor pursuant to this Agreement for any of the services performed by the Contractor to correct services, when such corrections are required as a direct result of negligence by the Contractor to properly fulfill any of its obligations herein.

CITY'S RIGHT TO WITHHOLD CERTAIN AMOUNTS AND MAKE APPLICATION THEREOF. If evidence is produced before the final settlement of all or any balances that the Contractor has failed to pay laborers employed on his work or failed to pay for materials used therein, or if the City has reason to suspect the same, the City may withhold such balances and upon evidence satisfactory to the City as to the amount due for such labor and materials, the City, acting as the agent of the Contractor, may settle and pay for the same and charge the amounts to the Contractor and deduct the same from the said balance or balances.

REMEDIES CUMULATIVE. All remedies available to the City herein are cumulative and shall be in addition to all other rights and remedies provided by law. The termination, expiration, or suspension of this Agreement shall not limit the City from pursuing other remedies available at law or in equity.

SUBCONTRACTING, ASSIGNMENT or TRANSFER. The Contractor shall not subcontract, assign, delegate or transfer all or part of its rights, responsibilities, or interest under this Agreement without the prior written consent of the City. Any purported assignment, transfer, or delegation in violation of this Section shall be voidable by the City. No subcontracting, assignment, delegation or transfer shall relieve the Contractor from performance of its duties hereunder; neither shall the City be responsible for the fulfillment of the Contractor's obligations to its transferors or subcontractors. Upon request of the City, the subcontracting, assigning, delegating or transferring party shall provide all documents evidencing the transfer. At any time, City may, in its sole discretion, revoke its prior approval of a subcontractor and direct Contractor to replace such subcontractor or perform the services that were being performed by such contractor itself if the City finds in its reasonable judgment that (i) such subcontractor's performance is materially deficient or otherwise unacceptable to City; (ii) good faith doubts exist concerning the subcontractor's ability to render future performance because of changes in the subcontractor's ownership, management, financial condition, or otherwise; or (iii) there have been one (1) or more material misrepresentations by or concerning the subcontractor. The City reserves the right to terminate the Agreement if Contractor, in whole or in part, is acquired by another entity during the term of this Agreement.

In the event the Contractor is allowed to sublet any part of the Agreement, the Contractor shall be as fully responsible to the City for the acts and omissions of the subcontractor and of the persons employed or directly or indirectly employed by the subcontractor as he is for the acts and omissions

of persons employed by Contractor. The Contractor shall not subcontract more than [@ SUBCONTRACTOR PERCENT @]% of the work required hereunder. The computation for percentages will be based on monetary values.

CONFLICT OF INTEREST. Neither party shall engage in any conduct or activity in the performance of this Agreement that constitutes a conflict of interest under applicable federal, state or local laws, rules and regulations.

The Contractor covenants that it has no public or private interest, and shall not acquire, any interest, directly or indirectly, which would conflict in any manner with the performance required under this Agreement, and the Contractor covenants that no gratuities, in the form of entertainment, gifts, or otherwise, were offered or given by the Contractor or any agent or representative of the Contractor, to any officer, official, agent or employee of the City, in an effort to secure the Agreement or favorable treatment with respect to any determinations concerning the performance of the Agreement. The Contractor warrants that no part of the total contract amount provided herein shall be paid directly or indirectly to any officer or employee of the City as wages, compensation, or gifts in exchange for acting as officer, agent, employee, subcontractor or consultant to the Contractor in connection with any work contemplated or performed relative to this Agreement. For breach or violation of this provision, the City shall have the right to recover or withhold the full amount of such gratuities.

COVENANT AGAINST CONTINGENT FEES. The Contractor warrants that it has not employed or retained any company or person other than a bona fide employee working solely for the Contractor, to solicit or secure this Agreement, and that it has not paid or agreed to pay any company or person, other than a bona fide employee working solely for the Contractor any fee, commission, percentage, brokerage fee, gift, or any other consideration contingent upon or resulting from the award or making of this Agreement. For breach or violation of this provision, the City shall have the right to recover the full amount of such fee, commission, percentage, brokerage fee, gift, or other consideration.

GENERAL COMPLIANCE WITH LAWS. The Contractor certifies that it is qualified or will take steps necessary to qualify to do business in the State of Tennessee and that it shall take such action as, from time to time, may be necessary to remain so qualified and shall obtain and maintain, at its own expense, all licenses, permits, insurance, and governmental approvals, if any, necessary to the performance of its obligations under this Agreement. Such permits and licenses shall be made available to the City, upon request.

The Contractor is assumed to be familiar with and shall comply with all applicable federal, state, and local laws, ordinances, and regulations in performing any of its obligations under this Agreement, including but not limited to the City of Memphis Living Wage Ordinance, the Fair Labor Standards Act, Occupational Safety and Health Administration (OSHA), and the Americans with Disabilities Act (ADA). The Contractor shall promptly notify the City of any conflict discovered between this Agreement and any applicable laws, rules, regulations, and/or permits and licenses, and await resolution of the conflict.

NON-DISCRIMINATION. The Contractor hereby agrees to comply with Title VI and Title VII of the Civil Rights Act of 1964 and all other federal, state or local laws prohibiting discrimination, which provide in whole or in part, that no person shall be excluded from participation in, or be denied benefits of, or be otherwise subjected to discrimination in the performance of this Agreement or in the Contractor's employment practices on the grounds of handicap and/or disability, age, race, color, religion, sex,

national origin, or any other classification protected by Federal, State or statutory law. The Contractor shall, upon request, show proof of such nondiscrimination, and shall post in conspicuous places available to all employees and applicants notices of nondiscrimination. In the event the Contractor fails to comply with the City's non-discrimination policy and any and all other laws prohibiting discrimination, this Agreement may be canceled, terminated or suspended in whole or in part by the City.

The City reserves the right to investigate any claims of illegal discrimination by the Contractor and in the event a finding of discrimination is made and upon written notification thereof, the Contractor shall take all necessary steps to cure and rectify such action to the reasonable satisfaction of the City. The Contractor's failure or refusal to do so shall be cause for termination of this Agreement in accordance with the terms of this Agreement.

EMPLOYMENT OF ILLEGAL IMMIGRANTS. The Contractor hereby certifies to comply with all applicable federal and state laws prohibiting the employment of individuals not legally authorized to work in the United States. Contractor shall not knowingly (i) utilize the services of illegal immigrants; or (ii) utilize the services of any subcontractor who will utilize the services of illegal immigrants in the performance of the contract. In the event the Contractor fails to comply with any and all local, state and federal laws prohibiting the employment of individuals not legally authorized to work in the United States, this agreement may be canceled, terminated or suspended in whole or in part by the City, and the Contractor may be prohibited from contracting to supply goods and/or services to the City for a period of one (1) year from the date of discovery of the usage of illegal immigrant services in the performance of a contract with the City.

SEVERABILITY. If any terms or provisions of this Agreement are held to be illegal, invalid or unenforceable as a matter of law, such provision shall be fully severable, and the remaining provisions of this Agreement shall remain in full force and effect and continue to be binding and shall not be affected by such provision or by its severance herefrom. Furthermore, in lieu of such unlawful, invalid, or unenforceable provision, the parties may negotiate in good faith to replace such provision with a valid, legal and enforceable provision that most closely approximates the parties' original intent.

NO WAIVER OF CONTRACTUAL RIGHT. No term or provision of this Agreement, or of any document executed pursuant hereto, shall be held to be waived, modified or deleted unless in writing and executed by the parties hereto . No delay or failure of the City to enforce any right or provision of this Agreement or in any document executed pursuant hereto shall operate as a waiver or relinquishment of the City's right to subsequently enforce and compel strict compliance with such provision or any other provision herein or in any document related hereto and specifically identified as a waiver of any succeeding breach thereto or of any other provision herein contained.

SUJBJECT TO FUNDING. This Agreement is subject to availability and annual appropriation of funds by the Memphis City Council. In the event sufficient funds for this Agreement are not available or appropriated by the Memphis City Council for any of its fiscal period during the term hereof, then the City shall immediately terminate this Agreement upon written notice to the Contractor. In the event of such termination, the Contractor shall be entitled to receive just and equitable compensation for any satisfactory work performed up to the termination date. Such termination by the City shall not be deemed a Breach of Contract by the City, and the Contractor shall have no right to any actual, general, specific, incidental, consequential, or any other damages whatsoever of any description or amount that

have not been earned as of the date of termination.

CONTRACTING WITH SMALL AND MINORITY FIRMS AND WOMEN'S BUSINESS ENTERPRISE. The Contractor shall take affirmative action to ensure that small, minority-owned and women-owned businesses, which have been certified by the City, are utilized when possible as sources of supplies, equipment, construction and services.

PUBLIC RECORDS. Notwithstanding anything to the contrary contained herein or within any other document supplied to the City by the Contractor, the Contractor understands and acknowledges that the City is a governmental entity subject to the State of Tennessee Public Records Act, and any reports, data or other information supplied to the City regarding services performed hereunder may be subject to disclosure as a public record in accordance with the laws of the State of Tennessee.

ORGANIZATION STATUS AND AUTHORITY. The Contractor represents and warrants that it is a corporation, limited liability company, partnership, or other entity duly organized, validly existing and in good standing under the laws of the state of Tennessee; it has the power and authority to own its properties and assets and is duly qualified to carry on its business in every jurisdiction wherein such qualification is necessary.

The execution, delivery and performance of this Agreement by the Contractor has been duly authorized by all requisite action and will not violate any provision of law, any order of any court or other agency of government, the organizational documents of the Contractor, any provision of any indenture, agreement or other instrument to which the Contractor is a party, or by which the Contractor's respective properties or assets are bound, in conflict with, result in a breach of, or constitute (with due notice or lapse of time or both) a default under any such indenture, agreement or other instrument, or result in the creation or imposition of any lien, charge or encumbrance of any nature whatsoever upon any of the properties or assets.

Each person executing this Agreement represents that: he/she is lawfully authorized to sign the Agreement on behalf of the party he/she represents and execution of the Agreement was duly and regularly authorized by the party's governing body.

WARRANTY. The Contractor warrants to the City that all goods/work shall be free from defects in design and faulty or improper workmanship and shall be in strict compliance with the terms of this Agreement. This warranty shall be effective for a period of not less than one year from the date of acceptance by the City of such goods and/or services as satisfactorily complete, and shall be in addition to all other warranties, express, implied or statutory. The warranty shall survive the termination or expiration of this Agreement.

RECORDS AND AUDITS. The Contractor shall make and keep as the same accrue, full and complete books, documents, accounting records and other evidence, that specifically relate to this Agreement, in accordance with generally accepted accounting principles. The Contractor shall retain such records, and shall make same available to the City, upon reasonable request, during the term of this Agreement, and for a minimum period of three (3) full years after completion of the contract obligations or from the date of final payment under this Agreement, whichever is later. In the event any litigation, claim or audit is instituted prior to the expiration of the required three-year retention period, such records shall be retained until such litigation, claim or audit finding has been

resolved. Copies of said records shall be furnished to the City upon request.

Upon reasonable notice, the Contractor shall permit the City, any other governmental entity, any agency participating in the funding of this Agreement, or any of their duly authorized representatives, to enter the Contractor's offices, during regular business hours, to interview employees and to inspect and/or copy said records and books of accounts together with any and all documents pertaining hereto that may be kept, maintained or possessed by the Contractor. Reviews may also be accomplished at meetings that are arranged at mutually agreeable times and places.

DISPUTE RESOLUTION. In the event of any dispute(s), controversy, or claim arising out of or relating to this Agreement or the breach thereof, the parties agree that they shall first use their best efforts in an attempt to settle the dispute through negotiations involving themselves or their representatives as they each deem appropriate.

Any dispute concerning a question of fact in connection with this Agreement between the Contractor and the City shall be referred in successive order for resolution, first to the City Purchasing Agent, second to the City Attorney, and thirdly to the Mayor of the City of Memphis, whose decision regarding same shall be final.

FORCE MAJEURE. The City shall not be deemed in default hereunder, nor shall the City be responsible for any delay, interruption, or cessation in the performance of its obligations under this Agreement where such failure of performance is the result of any force majeure event, including, but not limited to, acts of God, riots, wars, strikes, epidemics, acts, governmental authorities or acts of nature or other similar cause beyond its control.

SUCCESSORS AND ASSIGNS. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective heirs, legal representatives, successors and assigns. **NOTICES.** All notices and other communications required or permitted to be given hereunder shall be written and hand delivered with signed receipt; delivered by facsimile; delivered by a nationally recognized overnight courier; or mailed via certified U.S. mail, postage prepaid and return receipt requested. All notices shall be deemed received and effectively given as follows: (i) if by hand delivery, on the date of delivery; (ii) if by fax, on the day the fax transmission is received at the receiving location and receipt is telephonically confirmed by the sender; (iii) if by delivery via U.S. mail, on the date of receipt appearing on a return receipt card; or (iv) if by overnight courier, on the date receipt is confirmed by such courier service. All notices must be addressed to the respective party at the following addresses or to such other person or address as either party may designate in writing and deliver as provided herein:

To the CITY:
City of Memphis [@ DIVISION NAME @]
[@ ADDRESS - NOTICES @]
Memphis, TN [@ ZIP CODE - NOTICES @]
Attn: [@ CITY CONTACT/REPRESENTATIVE @]
Fax: [@ FAX NUMBER - CITY CONTACT/REPRESENTATIVE @]
With copy, if requested,
to:
City Attorney
125 N. Main, Room 336
Memphis, TN 38103

To the CONTRACTOR:
[@ CONTRACTOR NAME @]
[@ CONTRACTOR ADDRESS @]
[@ CONTRACTOR CITY @], [@ CONTRACTOR STATE @] [@ CONTRACTOR ZIP CODE @]
Attn: [@ CONTRACTOR REPRESENTATIVE @]
Fax: [@ FAX NUMBER - CONTRACTOR REPRESENTATIVE @]

NO THIRD PARTY BENEFICIARY: This Agreement is entered into solely between, and may be enforced only by, City and Contractor. Unless otherwise specified herein, this Agreement shall not be deemed to create any rights in third parties, including suppliers or customers of either party.

SERVICE MARKS. The Contractor agrees that it shall not, without City's prior written consent, use the name, service mark or trademarks of the City.

NUMBER AND GENDER. Unless the context requires otherwise, (i) use of a specific gender imports the other gender(s); and (ii) use of the singular imports the plural and vice versa.

SURVIVAL. The parties hereto acknowledge that provisions that require or contemplate performance or observance after expiration or termination of this Agreement shall survive the expiration or termination of this Agreement and continue in full force and effect.

DRAFTER. This Agreement is the result of arm's length negotiations between the parties and shall be construed to have been drafted by both parties such that any ambiguities in this Agreement shall not be construed against either party.

COUNTERPARTS. This Agreement may be signed in multiple counterparts and/or counterpart signature pages, each of which shall be deemed an original, and all of which when taken together shall constitute one and the same instrument. Signed signature pages may be transmitted by facsimile, and any such signature shall have the same legal effect as an original.

CITY LIABILITY. The City shall have no liability except as specifically provided in this Agreement. The City, by execution of this Agreement, assumes no liability for damages caused to persons or property by reason of Contractor providing services herein or for injury to any employee, agent or subcontractor of the Contractor performing under this Agreement.

INDEMNIFICATION. CONTRACTOR shall indemnify, defend, save and hold harmless the CITY and its officers, agents and employees from and against any and all claims, demands, suits, actions, penalties, damages, settlements, costs, expenses, or other liabilities of any kind and character, including without limitation attorney fees and litigation expenses, arising out of or in connection with the performance of this Agreement by Contractor, its employees, subcontractors, or agents or the breach of this Agreement by Contractor, its employees, subcontractors or agents. This obligation shall survive the expiration or termination of this Agreement.

The Contractor expressly understands and agrees that any insurance protection required by this

Agreement or otherwise provided by the Contractor shall in no way limit the Contractor's responsibility to indemnify, defend, save and hold harmless the City or its elected or appointed officials, officers, employees, agents, assigns, and instrumentalities as herein required.

The City reserves the right to appoint its own counsel regarding any matter defended hereunder. The Contractor acknowledges that the City has no obligation to provide legal counsel or defense to the Contractor, its employees or subcontractors in the event that a suit, claim or action of any character is brought by any person not a party to this agreement against the Contractor as a result of or relating to obligations under this agreement. The City shall have no obligation for the payment of any judgments or the settlement of any claims asserted against the Contractor or its subcontractors or employees as a result of or relating to the Contractor's obligations hereunder.

The Contractor shall immediately notify the City c/o City Attorney; 125 North Main, Suite 336; Memphis, TN 38103, of any claim or suit made or filed against the Contractor or its subcontractors regarding any matter resulting from or relating to the Contractor's obligations under this Agreement and agrees to cooperate, assist and consult with the City in the defense or investigation thereof.

GOVERNING LAW, JURISDICTION AND VENUE

The terms and conditions of this Agreement shall be construed in accordance with and governed by the laws of the State of Tennessee. All actions, whether sounding in contract or in tort, relating to the validity, construction, interpretation and enforcement of this Agreement shall be instituted and litigated in the courts of the State of Tennessee, located in Shelby County, Tennessee, without regard to conflicts of laws principles. In accordance herewith, the parties to this Agreement submit to the jurisdiction of the courts of the State of Tennessee located in Shelby County, Tennessee.

INSURANCE

As stated in the RFP specifications.

CONTRACT EXECUTION

IN WITNESS WHEREOF, the parties, by and through their duly authorized representatives, have executed this Agreement, effective as of the day and year first above written.

CITY OF MEMPHIS
By: _____
Jim Strickland, Mayor
_____ Approved :
_____ City Attorney Attest:
_____ Deputy Comptroller

[@ CONTRACTOR NAME @]
By: _____ Name: _____
_____ Title: